DOCUMENT RESUME

ED 268 265 CE 043 970

TITLE	Program Guide for Residential Plumbing 8721700 (IN46.052300) and Residential and Commercial Plumbing BCT0580 (IN46.050300).
INSTITUTION	University of South Florida, Tampa. Dept. of Adult and Vocational Education.
SPONS AGENCY	Florida State Dept. of Education, Tallahassee. Div. of Vocational, Adult, and Community Education.
PUB DATE	85
NOTE	141p.
PUB TYPE	Guides - Classroom Use - Guides (For Teachers) (052) -- Guides - Non-Classroom Use (055)
EDRS PRICE	MF01/PC06 Plus Postage.
DESCRIPTORS	Admission Criteria; Audiovisual Aids; Community Colleges; *Competence; Competency Based Education; Compliance (Legal); *Course Content; *Course Organization; Occupational Information; *Plumbing; Secondary Education; *State Curriculum Guides; State Legislation; *State Standards; Teacher Certification; Teacher Qualifications; Two Year Colleges; Vocational Education
IDENTIFIERS	*Florida; Vocational Industrial Clubs of America

ABSTRACT

This competency-based program guide provides course content information and procedures for Florida secondary schools, postsecondary vocational schools, and community colleges conducting programs in residential and commercial plumbing. The first section is on legal authority, which applies to all vocational education programs in Florida. The second section describes program content, including occupational descriptions, program standards description, competencies for residential plumbing and residential and commercial plumbing, curriculum frameworks and student performance standards for both types of plumbing, instructional approach, course outline and sample lesson plan, and information on student organizations. In the third section, student admission requirements and teacher certification and qualifications are spelled out, while the fourth section provides information on facilities and supplies for the plumbing curriculum. The final section lists instructor resources (both printed and audiovisual materials), and professional organizations and support services. Appendixes to the guide contain a diagram of facilities needed for the program and an organization chart for the student organization, Vocational Industrial Clubs of America. (KC)

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PROGRAM GUIDE
FOR

RESIDENTIAL PLUMBING
8721700 (IN46.052300)

AND

RESIDENTIAL AND COMMERCIAL PLUMBING
BCT0580 (IN46.050300)

Prepared by

Department of Adult & Vocational Education
College of Education
University of South Florida
Tampa, Florida 33620

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Division of Vocational, Adult, and Community Education

ACKNOWLEDGMENTS

The Division of Vocational, Adult, and Community Education would like to thank Raymond Hill, William Taylor, Robert Hicks, and Frances Gallivan, of the University of South Florida Adult and Vocational Education Department, for preparing this Guide, and Tal Rushing, Program Director Industrial Education Vocational Division of the Florida Department of Education, for assistance in reviewing it.

The Division would also like to thank the following teachers and industry representatives across the state who, by sharing ideas at conferences and workshops, have contributed to development of the materials included in this publication.

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INTRODUCTION

This Program Guide has been developed to provide information that will be useful to local school district and community college administrators, instructors, program advisory committee members, regional coordinating councils, and others charged with the responsibilty of offering vocational education programs. The final planning and evaluation of any educational program, however, must be done within the context of local conditions. This publication will serve to identify the major concerns that should be considered in the organization, operation, and evaluation of a vocational education program.

The Legal Authority sections of the Guide relate to vocational education programs in general. The remaining sections relate specifically to the vocational education program course for which the Guide is designed.

Vocational education has evolved to meet the needs of students desiring to pursue a selected vocation. In general, vocational education is designed to provide programs, services, and activities that are realistic in light of present and future employment opportunities. In recent years, applications of science and technology have expanded rapidly, increasing the education and training required of workers. The new technologies require many additional technical supportive staff to carry out both standardized and specialized procedures.

Today, vocational education is an increasingly viable option for students. The Florida Department of Education shares with business and industry the determination to provide opportunities for upward mobility to as many Floridians as possible. In order to do this, it is necessary both to create exemplary vocational programs and to make those programs consistent throughout the state.

State Board of Education Administrative Rule 6A-10.24: Articulation between universities, community colleges, and school districts outlines steps and guidelines that will bring about a systematic interrelationship between Florida institutions offering similar or related courses and programs. The rule states, in part, that:

> When a student tranfers among postsecondary vocational-technical centers, community colleges, and universities, the receiving institution shall award credit for courses satisfactorily completed at the previous institutions when the courses are judged ... to be equivalent to courses offered at the receiving institution.

This Program Guide helps ensure that equivalency. Throughout Florida, vocational programs; if implemented according to the criteria described in this document, will help many citizens fill an important place in our state and national work force.

LEGAL AUTHORITY

Program Standards

Vocational education programs are established pursuant to Florida Statutes (hereafter F.S.) and enabling Administrative Rules adopted by the Florida State Board of Education (hereafter S.B.E.).

Section 233.0682 F.S.: State Board regulations states:

> The State Board of Education shall adopt regulations setting forth minimum requirements for a comprehensive vocational education program, and shall adopt procedures for determining the extent to which such minimum requirements are being met. Such requirements shall include examination of the employment performance of program participants as well as standards of educational output, with particular emphasis on job placement and satisfactory performance in employment.

This statute is administered by S.B.E. Administrative Rule 6A-6.21: Comprehensive Vocational Education Program; definition, which states, in part, that:

> the term comprehensive vocational education shall include occupational education programs not leading to a bachelor's degree. A comprehensive vocational education program is one which provides vocational programs, services and activities of high quality, realistic in light of actual or anticipated opportunities for gainful employment and suited to the needs, interests, and abilities of the persons to be served.

For the purpose of defining the vocational education programs administered by community colleges within the state, the Division of Community Colleges has adopted S.B.E. 6A-14.34 to implement 240.355 F.S.: State Board of Education Rules, which authorizes "each community college district board of trustees to initiate and provide comprehensive vocational education programs." (NOTE: S.B.E. Rule 6A-14.34 is identical to S.B.E. Rule

6A-6.621 [see above], except that all S.B.E. Chapter 6A-14 rules refer to Division of Community College-sponsored programs, while S.B.E. Chapter 6A-6 rules refer to programs sponsored by the Division of Vocational, Adult, and Community Education.)

S.B.E. Rule 6A-6.571: Criteria for qualification of special vocational-technical education program courses provides for the annual publication of Vocational Education Program Courses Standards. These course standards for each vocational education program are approved by the Florida State Board of Education and published by the Division of Vocational, Adult, and Community Education.

The Program Course Standards provide program descriptions and statements of program objectives that must be adhered to by the school districts in offering vocational programs. The extent to which these Standards are adhered to forms the basis for program review and evaluation.

Special funding provisions for vocational programs are determined in relation to all other education programs under Section 236.081 F.S.: Funds for the operation of schools.

Program Planning

The Vocational Education Planning Process, published in 1980 by the Division of Vocational Education, outlines the procedures local education agencies should follow in developing and submitting their five-year and annual plans for the operation of vocational education programs.

The legal basis for program planning is found in Section 229.55 F.S.: Educational Accountability Act of 1976, and 299.555 F.S.: Educational planning and information systems. These statutes address various aspects of the process of planning effective instructional programs at each level—

from the local school district to the state level. These Florida Statutes are implemented by S.B.E. 6A-6.67: Coordinating Council for vocational education, adult general education, and community instructional services, S.B.E 6A-6.70: Direct job-related vocational offerings required for each school district, and S.B.E. 6A-6.71: Student services.

School districts are encouraged to utilize the resources and support of business, industry, and the community in planning vocational programs. A portion of S.B.E. Rule 6A-6.67, which has particular implications for planning for specific vocational programs in specific schools, follows:

> The responsibilities of the [coordinating] council shall be to review the total vocational education, adult general education, and community instructional services program being offered in the district, to make such recommendations as are necessary, to encourage the development of needed offerings or changes in existing offerings and to avoid unwarranted duplications.

(S.B.E. Rule 6A-14.37 addresses this topic in identical language for community college programs.)

Program Structure

The legal basis for Florida's comprehensive vocational education structure may be found in S.B.E. Rules 6A-6.621 and 6A-14.34: Comprehensive vocational education, definition; 6A-6.63 and 6A-14.343: Scope of vocational education; 6A-6.64 and 6A-14.344: Types of vocational education courses and activities; and 6A-6.65 and 6A-14.345: Instructional components of vocational education.

Perhaps the legal basis for Florida's comprehensive vocational program is stated best in S.B.E. Rules 6A-6.65 and 6A-14.345. These rules define the components of vocational education instruction, beginning with introduction to the world of work in grades 1-6; exploratory experiences in grades 7-9; job-related experiences and prevocational training instruction in grades 10-12; and adult-level training and retraining programs. Special needs of disadvantaged and handicapped individuals at all levels—grade 1 through adults—are considered and provided for. Based upon these rules, Florida has developed a statewide comprehensive vocational program that is recognized as one of the best in the nation.

Program Development

Vocational program development is geared to meet the needs of Florida's employers and students. The vocational planning process incorporates information from business and industry, including data on employers' needs and on emerging trends and changes in technological processes. Legal basis is provided by S.B.E. Rules 6A-6.64 and 6A-14.344, both entitled Types of vocational education courses and activities, for the development of the many vocational courses and programs that must be offered to meet the needs of employers and students. These rules will be amended in the future to bring them more into conformity with 1983 legislation.

Section 228.041 F.S. defines vocational education as follows:

> (22) "Vocational education" is defined as meaning that instruction not leading to a baccalaureate degree, either graded or ungraded, listed below:
>
> (a) Job-preparatory instruction in the minimum competencies necessary for effective entry into an occupation, including diversified cooperative education, work experience, and job entry programs which coordinate directed study and on-the-job training;
>
> (b) Exploratory courses designed to give students initial exposure to the skills and aptitudes associated with a broad range of occupations in order to assist them in making informed decisions regarding their future academic and occupational goals;

(c) Supplemental programs designed to enable persons who are or have been employed in a specific occupation to upgrade their competencies in order to re-enter or maintain stability or advance within their occupation; or

(d) Practical arts courses designed to teach students practical generic skills which, though applicable to some occupations, are not designed to prepare students for entry into specific occupations. Such courses may include, but may not be limited to, typing, industrial arts, and home economics.

Program development is based largely on identifying and meeting the requirements of employers and credentialling agencies. Significant input is sought from advisory groups, ad hoc committees, and task forces made up of representatives from business and industry and instructional, supervisory, and administrative personnel. The Division of Vocational, Adult, and Community Education, the school districts, and community colleges work together to develop programs with objectives that are consistent with employers' requirements.

Educational standards are established for program development. Using these standards as guides and guidelines, effective programs are developed that meet the goals of vocational education, particularly the major goal of preparing students for entry-level employment. These standards are grouped into three categories: input, process, and product. First, standards of input govern requirements for teachers, facilities, and materials. Second, standards of process help determine requirements for instruction, curriculum selection, placement, and evaluation. And third, standards of product are determined by the number and degree of competencies students achieve and by the placement of trained students in jobs.

Program Review and Evaluation

The primary purpose of program review is program improvement. To accomplish this purpose, a review of each vocational program is necessary to determine those areas in which program improvement can be implemented most effectively.

The legal basis for program review is found in Chapter 229.565 F.S. Educational evaluation procedures. Section (3)(e) of that statute requires the Commissioner of Education to periodically examine and evaluate "the standards by which the school district evaluates basic and special programs for quality, efficiency, and effectiveness."

The term "special programs," as used here, includes vocational programs. In turn, under S.B.E. Rule 6A-1.453: Educational program audits, the Commissioner directs the Division to examine and evaluate vocational programs.

S.B.E. Rule 6A-1.453 provides for periodic audits of both the accounts and programs of each school district. It states in part that the Division shall be responsible for examination of vocational education programs to:

a. Determine compliance with law and criteria established by rules of the State Board;

b. Ensure that individual courses use instructional objectives which are consistent with the criteria for qualification of individual courses as outlined in the publications titled, "Vocational Education Program Courses Standards," Rule 6A-6.571, FAC; and

c. Determine that the capability exists in the instructional setting to accomplish the course objectives.

Under this same rule, the Division also is responsible for: "Examination of adult and community education programs to determine compliance with law and criteria established by rules of the State Board" and "determination of the existence and comprehensiveness of the criteria based on district goals, by which the school district evaluates vocational education and adult general education programs."

The *Vocational Education Program Courses Standards* (and the new *Curriculum Frameworks*) provide program descriptions and objectives that may be used as criteria against which the program may be reviewed and evaluated. Basically, program review consists of a self-study by the staff of the program to be reviewed, a visitation and review by a Division staff member, a final report outlining areas of strengths and weaknesses, and a plan for strengthening weaknesses and/or improving the program. The data from the program review instruments are treated statistically and incorporated into the evaluation system.

Program Advisory Committees

Program advisory committees are mandated by federal (Public Law 90-576) as well as state regulations. A single State Advisory Council is provided for in S.B.E. Rule 6A-6.75: Advisory Council for Vocational Education. Committees for individual programs are covered under S.B.E. Rule 6A-6.74: Duties and responsibilities, which states that the director of the Division of Vocational, Adult, and Community Education shall "direct the work of the Division to insure the greatest possible coordination, efficiency and effectiveness in vocational and technical education in the state." The Division encourages program advisory committees as a means of fulfilling this mandate.

The Division utilizes a number of advisory committees in addition to those required by law. Each program area—Agribusiness and Natural Resources, Business, Diversified Occupations, Health Occupations, Home Economics, Industrial, Marketing and Distributive, and Public Service

Education—has a corresponding state advisory committee. Also, many general advisory committees have been formed to deal with special programs and problems.

Several advisory committees assist school districts and community colleges with vocational program planning and operation. The legal basis for such use of advisory committees may be found in S.B.E. Rules 6A-6.68 and 6A-14.38, both entitled Business and industrial community support. These rules state that school boards and boards of trustees at all levels should take positive steps (which are enumerated) to establish two-way communications and mutual responsiveness between their institution's vocational education program system and the surrounding business and industrial community.

These rules are responsive to the fact that in program development, implementation, and evaluation it is especially important that advisory committees be effectively utilized at the state and local levels. Community resources are an important part of vocational program development.

DESCRIPTION OF THE OCCUPATION

This Competency Based Program Guide provides course content information and procedures for secondary, postsecondary vocational schools, and community colleges, conducting programs in the occupational area of Residential Plumbing and Residential and Commerical Plumbing.

The Federal Dictionary of Occupational (D.O.T.) Job Titles identifies this occupational area as follows:

D.O.T. JOB TITLE	D.O.T. CODE
Pipe Fitter	(862.261-010)
Plumber	(862.381-030)
Laborer, Construction	(862.684-014)
Pipe Fitter Helper	(862.684-022)
Plumbing Assembler-Installer	(862.684-026)
Lawn-Sprinkler Installer	(869.684-030)

The definition (description) for each of these job titles is abstracted from the D.O.T. for easy reference.

Pipe Fitter (862.261-010)

Lays out, installs, and maintains ships' piping systems such, as steam heat and power, hot water, hydraulic, air pressure, and oil lines, following blueprints, and using handtools and shop machines: Plans layout of pipe sections, allowing for conformance to specifications, holes, and obstructions. Cuts and bores holes in bulkheads and decks for installation of pipes. Operates shop machines to cut and thread pipe and pipe fittings, such as valves, traps, and thermostats. Packs pipe with sand to avoid contortion of pipe and bends pipe to specified shape on pipebending fixture. Bolts or welds pipes. Connects pipes to fixtures, such as radiators, laundry, and galley equipment, pumps, and tanks, using wrench, and solders joints to seal connections, using torch. Repairs, packs, and adjustsd valves. Tests installed systems for leaks and to insure that system meets specifications, using hydrostatic and other pressure test equipment.

Plumber (862.381-030)

Assembles, installs, and repairs pipes, fittings, and fixtures of heating, water, and drainage systems, according to specifications and plumbing codes: Studies building plans and working drawings to determine work aids required and sequence of installations. Inspects structure to ascertain obstructions to be avoided to prevent weakening of structure resulting from installation of pipe. Locates and marks position of pipe and pipe connections and passage holes for pipes in walls and floors, using ruler, spirit level, and plumb bob. Cuts and threads pipe, using pipe cutters, cutting torch, and pipe-threading machine. Bends pipe to required angle by use of pipe-bending machine or by placing pipe over block and bending it by hand. Assembles and installs valves, pipe fittings, and pipes composed of metals, such as iron, steel, brass, and lead, and nonmetals, such as glass, vitrified clay, and plastic solvent, and calks joints. Fills pipe system with water or air and reads pressure gages to determine whether system is leaking. Installs and repairs plumbing fixtures, such as sinks, commodes, bathtubs, water heaters, hot water tanks, garbage disposal units, dishwashers, and water softeners. Repairs and maintains plumbing, by replacing washers in leaky faucets, mending burst pipes, and opening clogged drains. May weld holding fixtures to steel structural members.

Laborer, Construction (862.684-014)
Performs any combination of following tasks in laying, repairing,and extending underground gas and steam mains and distribution pipes: Erects barricades and places lanterns around worksite to protect workers from street traffic. Breaks up pavement, using airhammer, and digs ditches preparatory to laying or removing pipe. Maneuvers pipe sections, valves, and fittings into position, and holds pieces steady while worker tightens threaded connections. Cuts, threads, and joins pipe sections as directed. Assists Pipe Calker in calker in calking pipe joints. Mixes and lays concrete to raise top of manhole to level of new street construction. Patches cracks in underground vault walls with concrete and brushes or sprays walls with waterproof compound. May drive truck and tend mobile ventilating equipment to supply fresh air to workers in underground vaults.

Pipe Fitter Helper (862.684-022)
Assists Pipe Fitter to assemble and install piping for air, ammonia, gas, and water systems: Cuts or drills holes in walls to permit passage of pipes, using pneumatic drill. Selects specified type and size of pipe. Mounts pipe hangers and brackets on walls and ceiling to hold pipe. Assists Pipe Fitter to install valves, couplings, and other fittings. May dissassemble and remove damaged or worn pipe.

Plumbing Assembler-Installer (862.684-026)
Assembles and installs manufactured building bathroom hardware, fixtures,

and plumbing, under direction of Plumber. Cuts copper tubing according to written instructions, using powersaw. Connects, solders, and squares pipes, using solder paste or solder torch, vise, and level. Selects preassembled wall plumbing units, such as risers, air chamber, and valves, according to diagram. Fastens units to studs with metal braces, using hammer and nails. Selects, assembles, and installs fixtures, such as tub, sink, toilet, and shower fixtures, using handtools. Applies glue to vanity and sets vanity in place.

Lawn-Sprinkler (869.684-030)

Inspects, maintains, repairs, and replaces control devices, such as water pressure regulators, gate valves, and hydrants on water mains in water treatment and distribution systems: Inspects, disassembles, and repairs damaged or malfunctioning control devices of water distribution systems, using handtools. Cleans parts of rust and scale, using scraper and emery cloth. Lubricates wearing surfaces of movable parts. Replaces defective parts or installs new control devices, using handtools. Turns pentagonal nut, using hand wrench or handwheel to adjust control devices regulators to control water pressure and flow for operating conditions, such as water main leaks, shut-offs, and for trial and emergency purposes. May grind valve seat to remove surface flaws to avoid leakage, using special grinding tool. Prepares requisition and reports concerning materials needed to effect repairs, cause, and extent of damage to equipment.

PROGRAM STANDARDS DESCRIPTION

INTRODUCTION

The Division of Vocational, Adult, and Community Education, Florida State Board of Education, is required by S.B.E. Rule 6A-6.571, to publish VOCATIONAL EDUCATION PROGRAM COURSE STANDARDS annually. The first such standards were published in 1985 and consisted of brief 1-2 page documents called CURRICULUM FRAMEWORKS. These Frameworks contained very brief statements of program objectives and course standards.

Curriculum Frameworks are included in this section of the Program Guide, and contain revised information based on the industry validated competency list. Along with the Curriculum Frameworks are detailed lists of performance objectives called STUDENT PERFORMANCE STANDARDS. The Student Performance Standards are basically performance objective statements for each item on the competency list.

—CAREER MAP COMPETENCY LIST

The Career MAP Competency List was developed by an Industry Advisory Committee and serves as the basis for the Career MAP. This Competency List has been validated by the Industry Representatives and reviewed by Educational Representatives noted in the acknowledgements section of this guide. The list relects the entire range of job tasks performed by employees in industry related jobs. It may include more tasks than is normally taught in a vocational program at any one particular school level and will require that instructors and administrators determine which specialty areas and tasks are appropriate for their program.

—CURRICULUM FRAMEWORKS

The Curriculum Framework specifies the course title and course number, applicable level, major course concepts, and intended outcomes. The intended outcomes section has been correlated with the competency list to include only those performance areas applicable to the course level and purpose.

—STUDENT PERFORMANCE STANDARDS

The Student Performance Standards are abstracted from the Career MAP Competency List, and corresponds to the Curriculum Framework. Student Performance Standards list the detailed performance objectives that support the intended outcomes identified in the Curriculum Frameworks.

—PROGRAM ARTICULATION

Vocational programs that teach the same subject at high schools, vocational technical schools, and community colleges should be structured to eliminate unnecessary retraining of students who have mastered competencies at a lower school level. This coordination of programs at different school levels is referred to as ARTICULATION. Specifically -ARTICULATION- is an arrangement between secondary and vocational-technical centers, and community colleges, which would allow a student who completed a secondary vocational program to enter an area vocational-technical center or community college and receive credit for the secondary vocational program and be placed in the higher level program at an advanced level. It would also allow a student who completed a vocational program in an area vocational-technical center to enter a community college program and receive credit for the area vocational-technical center program and be placed in the higher level program at an advanced level.

ARTICULATION in this manner will require vocational teachers to interview each student entering a postsecondary level program and determine what competencies have been previously mastered. The teacher may have to utilize the Career MAP, if available, or some type of pre-test or performance evaluation to verify that the student is in fact still competent in the appropriate tasks. Teachers of postsecondary programs will often have two or more course tracks operating simultaneously, one for those students with no prior experience, and one or more individualized or small group tracks for students with various levels of prior experience.

—CAREER MAP UTILIZATION

I. Career MAP Definition:

A Career Merit Achievement Plan (Career MAP) is a matrix of vocational competencies that is designed for individual students to record the skills they have mastered in school or industry. The MAPs primarily list performance competencies, although some cognitive competencies are included. Career MAPs contain blocks in which each individual task is listed and includes a line for the instructor to sign, indicating that the student has become competent in the performance of the task. Career Maps are published and distributed separately from the Program Guide.

II. Purpose of Career MAPs:

Career MAPs are being developed for each Industrial Education program in the State of Florida as a means to document student activity and performance and to communicate that activity to employers. The MAPs, showing what a student has already mastered, could also be used by the student when transfering to another school system or a higher level program, to integrate the student into those training programs at the student's level of competence. This is particularly important when entering competency based programs using "open entry-open exit" methodology, or when entering an on-the-job industrial training course. Many companies require employees to periodically attend skill upgrade and crosstraining courses and attend short courses for new equipment and process familiarization. The Career MAP can also be used by employees to record their achievement in industry sponsored training activity, so the MAP becomes an individuals lifetime record of technical competency.

III. Recommended Utilization of Career MAPs:

A. Teachers in Florida Industrial Education and other Vocational related programs should provide every student they teach, a Career MAP to record the student's mastery of each competency completed in the course. Teachers should ensure that the use of Career MAPs are explained to students and should ensure that the students take their Career MAPs with them when they leave the course.

B. Students should use Career MAPs as a record of their technical competence as they progress from high school courses and/or through vocational technical schools, or through community colleges and on into industrial training programs provided by employers. Students pursuing vocational technical careers should use the Career MAP as an overall record of their entire career achievement, maintaining other individual certificates of course completion as supporting documents for Career MAPs.

IV. Career Map Development:

Draft lists of competencies were developed by Industrial Advisory committees under a project administered by the Univerisity of South Florida and funded by the Vocational Division of the State Department of Education. These lists were then reviewed, revised, and validated by craft advisory committees throughout Florida. Committees of teachers as well as industry experts then reviewed the lists. Finally, after Competency Lists were approved by both industry and educational advisors the lists were typeset in a matrix format and printed by the Department of Education. The developers of the MAPs had access to any V-TECS catalogs or Student Performance Standards that were applicable. If objectives were judged relevant they were included but sometimes in different wording. Some competencies listed on the MAP may actually encompass several objectives from other sources or might even be considered as subskills to V-TECS. Career MAPs list competencies that could be learned either in school or after a person has been on the job. Career MAPs, as the words suggest, map the competencies achieved by a person through school training and job experiences.

V. Career MAP's use with Program Guides and Standards:

Course/Program Standards have traditionally been used in the Program Review process and will continue to be used. The Career MAPs do not replace Course/Program Standards. MAPs usually contain competencies beyond those required at the job-entry level. Future editing of Course/Program Standards will more than likely reflect the wording of many of the competencies in the Career MAPs.

Program Guides will be developed for all vocational programs having validated MAPs. The Guide brings together into one document the critical components necessary to initiate or update an existing program. Included in the Program Guide are the MAP competencies, the Program Standards, and guidelines for curriculum development, use of local craft advisory committees, facilities planning, etc.

Career MAPs are intended to facilitate articulation and communication regarding specific vocational programs. The Career MAP is a baseline document for planning and can be used for a variety of purposes: student counseling; curriculum planning; teacher recruitment, and selection; teacher and program updating; facility layout and design; equipment requirement planning; student evaluation; program improvement; and for discussions with craft advisory committees.

Career MAPs can be used to profile the competencies to be mastered for one or more Dictionary of Occupational Titles (DOT) occupations within the major occupational area. Career MAPs reflect state-of-the-art technology for the occupational area and accommodate competency mastery in an industrial setting through cooperative or internship arrangements. Some advanced competencies included on the MAPs are desirable but not necessary for initial employment and may be learned later as supplemental training. Teachers can acquire class sets of the MAPs and use them daily with students from the first day of instruction, or, after keeping separate records of students' mastery of competencies, teachers can transfer these to the MAP just before students exit from the program. Students can request future employers to authenticate additional competencies as they master them on the job.

VI. Obtaining Additional MAPs:

Contact the Industrial Education Regional Consultant or the DVE Regional Office to order MAPs. Entire class sets are available for teacher use. Teachers or users outside the targeted population may purchase sets for a nominal cost-recovery fee. For additional information or training in the use of the Career MAPs contact the Regional Consultant or:

Dissemination and Diffusion Section
Division of Vocational Adult
& Community Education
Department of Education
Knott Building
Tallahassee, FL 32301
(904) 488-0405 or Suncom 278-0405

VALIDATED LIST OF COMPETENCIES

RESIDENTIAL PLUMBING

and

RESIDENTIAL AND COMMERCIAL PLUMBING

November 25, 1985

Listed below are competencies that each Plumbing Technician should possess to be a productive beginning worker in this occupation. The numbers to the right of each competency represent the specialization areas indicated below. If a number appears to the right of a competency, that competency is considered essential to the specialization area.

Number	Specialization
1	Pipe Fitter (862.261-010)
2	Plumber (862.381-030)
3	Laborer, Construction (862.684-014)
4	Pipe Fitter Helper (862.684-022)
5	Plumbing Assembler-Installer (862.684-026)
6	Lawn-Sprinkler Installer (869.684-030)

01.0 BASIC PLUMBING SKILLS

001	Comply with shop policies & procedures (P)	1 2 3 4 5 6
002	Explain the basic theory & principles of plumbing (C)	1 2 3 4 5 6
003	Identify & use hand tools (P)	1 2 3 4 5 6
004	Identify equipment & safety hazards (C)	1 2 3 4 5 6
005	Apply safety procedures (P)	1 2 3 4 5 6
006	Identify pipe fittings (C)	1 2 3 4 5 6
007	Identify pipe joining methods (C)	1 2 3 4 5 6
008	Identify plumbing fixtures & appliances (C)	1 2 3 4 5 6
009	Read & interpret & comply with manufacturers' schematics & specifications (P)	1 2 3 4 5 6
010	Find information in technical literature (P)	1 2 3 4 5 6
011	Give reports orally & in writing (P)	1 2 3 4 5 6
012	Listen to & comply with oral & written instructions (P)	1 2 3 4 5 6

02.0 JOINING PIPE

001	Wipe a clay pipe joint (P)	1 2 3 4 5 6
002	Join clay pipe with a pipe coupling (P)	1 2 3 4 5 6
003	Join a cast-iron pipe to a clay sewer pipe (P)	1 2 3 4 5 6
004	Join plastic pipe using the adapter-solvent cement method (P)	1 2 3 4 5 6
005	Cut concrete pipe (P)	1 2 3 4 5 6
006	Bend steel pipe with a heavy-duty bending tool (P)	1 2 3 4 5 6

007	Bend steel pipe with a chain vise & torch (P)	1 2 3 4 5 6
008	Cut steel pipe with a one-wheel steel-pipe cutter (P)	1 2 3 4 5 6
009	Cut steel pipe with a four-wheel steel-pipe cutter (P)	1 2 3 4 5 6
010	Join a plastic pipe to a steel pipe (P)	1 2 3 4 5 6
011	Thread steel pipe with an adjustable diestock (P)	1 2 3 4 5 6
012	Thread steel pipe with a nonadjustable diestock (P)	1 2 3 4 5 6
013	Thread steel pipe with a power-driven vise stand (P)	1 2 3 4 5 6
014	Cut copper tubing or pipe with a hacksaw (P)	1 2 3 4 5 6
015	Cut copper tubing or pipe with a tubing cutter (P)	1 2 3 4 5 6
016	Bend copper tubing or pipe with a spring bender (P)	1 2 3 4 5 6
017	Join copper tubing or pipe to copper tubing or pipe (P)	1 2 3 4 5 6
018	Join copper tubing to brass pipe (P)	1 2 3 4 5 6
019	Join copper tubing with a compressed connector (P)	1 2 3 4 5 6
020	Join copper tubing to steel pipe (P)	1 2 3 4 5 6
021	Join copper tubing or pipe to plastic pipe using the sweat method (P)	1 2 3 4 5 6
022	Join copper tubing or pipe to plastic pipe (P)	1 2 3 4 5 6
023	Join cast-iron soil pipe using lead & oakum (P)	1 2 3 4 5 6
024	Cut cast-iron soil pipe with a snap-type chain cutter (P)	1 2 3 4 5 6
025	Join cast-iron soil pipe with a hubless or band-clamp coupling (P)	1 2 3 4 5 6
026	Join steel pipe to a cast-iron pipe with a hubless coupling (P)	1 2 3 4 5 6
027	Join plastic pipe to cast-iron pipe with a hubless coupling (P)	1 2 3 4 5 6

028	Braze pipe with a gas torch & filler metal (P)	1 2 3 4 5 6
029	Weld pipe with an oxyacetylene torch & filler metal (P)	1 2 3 4 5 6
030	Join pipe with an electric arc welder & filler filler metal (P)	1 2 3 4 5 6

03.0 BLUEPRINTS & SPECIFICATIONS

001	Apply basic math skills (P)	1 2 3 4 5 6
002	Read & interpret an architect's scale (P)	1 2 3 4 5 6
003	Read & interpret a 6-foot rule (P)	1 2 3 4 5 6
004	Recognize & identify basic plumbing symbols (C)	1 2 3 4 5 6
005	Explain the basic theory & principles of isometrics (C)	1 2 3 4 5 6
006	Select fixtures (P)	1 2 3 4 5 6

04.0 LAYING OUT A JOB

001	Determine a materials list (P)	1 2
002	Select materials specifications (P)	1 2

05.0 FIRST ROUGH (UNDERGROUND)

001	Lay out a job on site (P)	1 2 3 4 5

002	Install building drain, waste, & vent systems (P)	1 2 3 4 5
003	Install a distribution system (P)	1 2 3 4 5
004	Install water service (P)	1 2 3 4 5
005	Install a building sewer/septic tank &/or approved sewer system (P)	1 2 3 4 5
006	Test the first rough (P)	1 2 3 4 5

06.0 SECOND ROUGH (FIRST FLOOR & ABOVE)

001	Lay out a job on site (P)	1 2 3 4 5
002	Install hangers & supports (P)	1 2 3 4 5
003	Install building drain, waste, & vent systems (P)	1 2 3 4 5
004	Install a water distribution system (P)	1 2 3 4 5
005	Test the second rough (P)	1 2 3 4 5

07.0 TRIMMING OUT PLUMBING

001	Distribute & place fixtures & appliances (P)	1 2 3 4 5
002	Install fixtures & trim out (P)	1 2 3 4 5
003	Install closet flanges (P)	1 2 3 4 5
004	Install speed-stops on water pipes (P)	1 2 3 4 5
005	Trim out a lavatory (P)	1 2 3 4 5
006	Trim out a water closet (P)	1 2 3 4 5
007	Trim out a bath tub (P)	1 2 3 4 5

008	Trim out a shower (P)	1 2 3 4 5
009	Trim out a kitchen sink (P)	1 2 3 4 5
010	Trim out a washing-machine drain & piping (P)	1 2 3 4 5
011	Install a garbage disposal (P)	1 2 3 4 5
012	Hook up an ice maker (P)	1 2 3 4 5
013	Install a water heater & trim out (P)	1 2 3 4 5
014	Install a dishwasher & hook up (P)	1 2 3 4 5
015	Test & inspect the final installation (P)	1 2 3 4 5
016	Conduct a purification test (P)	1 2 3 4 5

08.0 PLUMBING SYSTEMS REPAIR, SERVICE, & MAINTENANCE

001	Establish positive customer relations (P)	1 2
002	Troubleshoot & diagnose the system (P)	1 2
003	Isolate the problem (P)	1 2
004	Determine the alternative solutions (P)	1 2
005	Obtain a decision from customer (P)	1 2
006	Repair a sewer main (P)	1 2
007	Repair a water main (P)	1 2
008	Repair a water-closet seat, ball cock, flush valve, float, lift rod, ball stopper, & trip lever (P)	1 2
009	Repair leaks in traps (P)	1 2
010	Repair leaks in faucets (P)	1 2
011	Install sink strainers (P)	1 2
012	Install a heater element (P)	1 2

013	Replace or repair fixture water-supply pipes (P)	1 2
014	Reseal a toilet to the flange (P)	1 2
015	Test & inspect a repaired system (P)	1 2
016	Explain the nature of the problem; take remedial action; & advise the customer on preventive maintenance (P)	1 2
017	Prepare a job ticket (P)	1 2
018	Price the job & write the invoice (P)	1 2
019	Collect for services rendered (P)	1 2

09.0 PLUMBING CODES

* 001	Describe & explain the purpose of Plumbing Codes (C)	1 2
* 002	Apply the basic theory & principles of plumbing in relation to the codes (P)	1 2
* 003	Read & locate information in the Plumbing Code (P)	1 2
* 004	Explain & define terminology used in the Code (C)	1 2
* 005	Explain why the Code may supercede manufacturers' specifications on products (C)	1 2

10.0 DOMESTIC HOT WATER HEATING & CIRCULATING SYSTEMS

* 001	Explain the basic theory of domestic hot water heating & circulating systems (C)	1 2 3 4 5

* 002	Design the sizing & layout of a system (P)	1 2 3 4 5
* 003	Select equipment & materials in accordance with job specifications (P)	1 2 3 4 5
* 004	Lay out a job on site (P)	1 2 3 4 5
* 005	Install a distribution system (P)	1 2 3 4 5
* 006	Apply insulation (P)	1 2 3 4 5
* 007	Install a hot-water heater or boiler (P)	1 2 3 4 5
* 008	Install equipment controls (P)	1 2 3 4 5
* 009	Install safety devices (P)	1 2 3 4 5
* 010	Test for balance & inspect the final heating installation (P)	1 2 3 4 5
* 011	Balance & adjust controls (P)	1 2 3 4 5

11.0 HOT WATER/STEAM HEATING SYSTEMS

* 001	Explain the basic theory & principles of hot water & steam heating systems (C)	1 2 3 4 5
* 002	Apply safety procedures (P)	1 2 3 4 5
* 003	Identify special materials (C)	1 2 3 4 5
* 004	Lay out a job on site (P)	1 2 3 4 5
* 005	Install a distribution system (P)	1 2 3 4 5
* 006	Apply insulation (P)	1 2 3 4 5
* 007	Install a hot-water or steam generator or a boiler (P)	1 2 3 4 5
* 008	Install controls (P)	1 2 3 4 5
* 009	Install safety devices (P)	1 2 3 4 5

* 010	Install terminal devices (radiator, steam table, etc.) (P)	1 2 3 4 5
* 011	Test for balance & inspect the final heating installation (P)	1 2 3 4 5
* 012	Balance & adjust controls (P)	1 2 3 4 5

12.0 INSULATION

* 001	Explain the basic theory of insulation (C)	1 2 3 4 5
* 002	Select materials in accordance with job specifications (P)	1 2 3 4 5
* 003	Explain the different methods of applying insulation (C)	1 2 3 4 5

13.0 UTILITIES (WATER MAINS, SANITARY SEWERS, STORM SEWERS, GAS MAINS)

* 001	Check for conflict with other utilities (P)	1 2
* 002	Explain the basic standards used in the installation of all utilities (C)	1 2
* 003	Interpret site plans & locate utilities (P)	1 2
* 004	Identify special materials & procedures (P)	1 2
* 005	Explain methods of tapping & connecting to mains (C)	1 2
* 006	Explain the application of pumping systems to mains (C)	1 2
* 007	Explain the need for as-built drawings & records (C)	1 2

* 008	Explain the application of OSHA & other safety regulations (C)	1 2
* 009	Explain the importance of integrating each utility system so as to avoid cross-connecting (C)	1 2

14.0 SEPTIC TANK SYSTEMS

* 001	Explain the theory & function of septic tank systems (C)	1 2 3 4 5
* 002	Identify & explain the uses of various components of a septic tank system (C)	1 2 3 4 5
* 003	Explain the procedures of soil percolation & the the obtaining of permits & approvals (C)	1 2 3 4 5

15.0 INTERCEPTORS & SEPARATORS

* 001	Identify the various types of a variety of interceptors & separators (C)	1 2 3 4 5
* 002	Explain the theory & function of the various interceptors & separators (C)	1 2 3 4 5
* 003	Install & maintain a lint trap (P)	1 2 3 4 5
* 004	Install & maintain a grease trap (P)	1 2 3 4 5
* 005	Install & maintain gas & oil separators (P)	1 2 3 4 5
* 006	Install & maintain sand & sediment interceptors (P)	1 2 3 4 5

16.0 GAS & FUEL PIPE

* 001	Explain the importance of safety in the design & installation of gas systems & components (controlled by AGA) (C)	1 2 3 4 5
* 002	Design the sizing & layout of system in accordance with AGA standards (P)	1 2 3 4 5
* 003	Select materials in accordance with specifications (P)	1 2 3 4 5
* 004	Lay out a job on site (P)	1 2 3 4 5
* 005	Install a distribution system (P)	1 2 3 4 5
* 006	Install equipment & controls (P)	1 2 3 4 5
* 007	Install safety devices (P)	1 2 3 4 5
* 008	Test & inspect the installed system (P)	1 2 3 4 5

17.0 IRRIGATION SYSTEMS

* 001	Explain the theory & procedures of landscape & commercial irrigation systems (C)	1 2 3 4 5 6
* 002	Design, size, & lay out a landscape &/or commercial irrigation system (P)	1 2 3 4 5 6
* 003	Select materials in accordance with given specifications (P)	1 2 3 4 5 6
* 004	Lay out a job on site (P)	1 2 3 4 5 6
* 005	Install a distribution system (P)	1 2 3 4 5 6

* 006	Install equipment & controls (P)	1 2 3 4 5 6
* 007	Test & inspect the system (P)	1 2 3 4 5 6

18.0 ROOF DRAINS & LEADERS

* 001	Explain the theory of roof drains & leaders (P)	1 2 3 4 5
* 002	Design, size & lay out system (P)	1 2 3 4 5
* 003	Select materials in accordance with specifications (P)	1 2 3 4 5
* 004	Lay out job on site (P)	1 2 3 4 5
* 005	Install distribution system (P)	1 2 3 4 5
* 006	Install the roof drains & leaders (P)	1 2 3 4 5
* 007	Test & inspect the system (P)	1 2 3 4 5

19.0 SOLAR HEATING (OPTIONAL) **

* 001	Explain the history & theory of solar heating (C)	1 2 3 4 5
* 002	Identify various solar heating applications (C)	1 2 3 4 5
* 003	Identify various materials used in solar heating (C)	1 2 3 4 5
* 004	Design a domestic solar water-heating system (P)	1 2 3 4 5
* 005	Choose materials for a domestic solar water-heating system (P)	1 2 3 4 5
* 006	Lay out a job on site (P)	1 2 3 4 5
* 007	Install transmission lines & low-voltage wiring (P)	1 2 3 4 5
* 008	Install storage tanks (P)	1 2 3 4 5

* 009	Install controls (P)	1 2 3 4 5
* 010	Install safety devices (P)	1 2 3 4 5
* 011	Install solar panels (P)	1 2 3 4 5
* 012	Install controls at the panels (P)	1 2 3 4 5
* 013	Install safety devices at the panels (P)	1 2 3 4 5
* 014	Fill & test the system (P)	1 2 3 4 5
* 015	Operate the system & adjust the controls (P)	1 2 3 4 5
* 016	Explain the operation & maintenance of the system to others, including freezing precautions (C)	1 2 3 4 5

20.0 EMPLOYABILITY SKILLS

001	List sources of job openings other than public or private employment agencies (P)	1 2 3 4 5 6
002	Write a letter of application for a job (P)	1 2 3 4 5 6
003	Prepare a resume or personal fact sheet (P)	1 2 3 4 5 6
004	List factors to consider when applying for a job (P)	1 2 3 4 5 6
005	List ways of making contact with employers (P)	1 2 3 4 5 6
006	Identify documents which may be required when applying for a job interview (C)	1 2 3 4 5 6
007	Complete a job application form correctly (P)	1 2 3 4 5 6
008	Identify appropriate dress & grooming for a job interview (C)	1 2 3 4 5 6
009	Classify behaviors considered to be appropriate in a job interview situation (C)	1 2 3 4 5 6

010	Describe the advantages to the employer & employee of being a productive worker (C)	1 2 3 4 5 6
011	Explain the purpose of supervision, self-discipline & performance evaluation (C)	1 2 3 4 5 6
012	Identify appropriate response(s) to criticism from employer, supervisor, or other employees (C)	1 2 3 4 5 6
013	List consequences of frequently being absent from the job (P)	1 2 3 4 5 6
014	List consequences of frequently arriving late for work (P)	1 2 3 4 5 6
015	List factors to consider when resigning from a job (P)	1 2 3 4 5 6
016	Write a letter of resignation (P)	1 2 3 4 5 6

KEY

(C)	Cognitive
(P)	Performance

* These competencies are included in the list for Residential & Commercial Plumbing ONLY.

DRAFT RECOMMENDATIONS AS OF 1/1/86

CURRICULUM FRAMEWORK PROGRAM AREA: Industrial

FLORIDA DEPARTMENT OF EDUCATION EFFECTIVE DATE: July, 1986

PROGRAM TITLE: Residential Plumbing

CODE NUMBER: Secondary 8721700 Postsecondary ________

Florida CIP IN46.052300

SECONDARY SCHOOL CREDITS 6 COLLEGE CREDITS _____ POSTSECONDARY ADULT VOCATIONAL CREDITS _____

APPLICABLE LEVELS(S): ___ 7-9 ___ 9-12 ___ Postsecondary Adult Vocational

___ Postsecondary Vocational X Other (10-12, 21)

CERTIFICATION COVERAGE: TEC CONSTR @ 7 BLDG CONSTR @ 7
PLUMBIN 7

I. MAJOR CONCEPTS/CONTENT: The purpose of this program is to prepare students for employment as plumbers (862.381-030), pipefitter helpers (862.684-022), or lawn sprinkler installers (869.684-030).

The content includes, but is not limited to, communication skills, leadership skills, human relations and employability skills, safe and efficient work practices, use of tools and equipment, blueprint reading, and the assembly, installation, and repair of pipes, fittings, and fixtures of residential heating, water, and drainage systems according to specifications and plumbing codes.

II. LABORATORY ACTIVITIES: Shop or laboratory activities are an integral part of this program and provide instruction in planning, layout, and installation of residential plumbing systems including water supply, sewer, drain, waste, and vent systems.

III. SPECIAL NOTE: The Vocational Industrial Clubs of America, Inc., is an appropriate vocational student organization for providing leadership training experiences and reinforcing specific vocational skills. When provided, these activities are considered an integral part of this instructional program.

Students completing this program may develop additional skills by enrolling in a residential and commercial plumbing program in a postsecondary school.

The cooperative method of instruction may be utilized for this program. Whenever the cooperative method is offered, the following is required for each student: a training plan which includes instructional objectives and a list of on-the-job and in-school learning experiences; a work station which reflects equipment, skills, and tasks relevant to the occupation the student has chosen as a career goal.

When the cooperative education method of instruction is used, the program length for the secondary program may be increased by a maximum of 2.0 credits.

The typical length of this program for the average achieving student is 900 contact hours (1080 clock hours).

IV. INTENDED OUTCOMES: After sucessfully completing this program, the individual will be able to:

01. Perform basic plumbing skills
02. Join pipe
03. Read and interpret blueprints and specifications
04. Lay out a job
05. Install first rough (underground)
06. Install second rough (first floor and above)
07. Trim out plumbing
08. Repair, service, and maintain plumbing systems
09. Demonstrate employability skills

STUDENT PERFORMANCE STANDARDS

RESIDENTIAL PLUMBING

01.0 PERFORM BASIC PLUMBING SKILLS—The student will be able to:

01.001 Comply with shop policies and procedures
01.002 Explain the basic theory and principles of plumbing
01.003 Identify and use hand tools
01.004 Identify equipment and safety hazards
01.005 Apply safety procedures
01.006 Identify pipe fittings
01.007 Identify pipe joining methods
01.008 Identify plumbing fixtures and appliances
01.009 Read and interpret and comply with manufacturers' schematics and specifications
01.010 Find information in technical literature
01.011 Give reports orally and in writing
01.012 Listen to and comply with oral and written instructions

02.0 JOIN PIPE—The student will be able to:

02.001 Wipe a clay pipe joint
02.002 Join clay pipe with a pipe coupling

02.003 Join cast-iron pipe to clay sewer pipe

02.004 Join plastic pipe using the adapter-solvent cement method

02.005 Cut concrete pipe

02.006 Bend steel pipe with a heavy-duty bending tool

02.007 Bend steel pipe with a chain vise and torch

02.008 Cut steel pipe with a one-wheel steel pipe cutter

02.009 Cut steel pipe with a four-wheel steel pipe cutter

02.010 Join plastic pipe to steel pipe

02.011 Thread steel pipe with an adjustable diestock

02.012 Thread steel pipe with a nonadjustable diestock

02.013 Thread steel pipe with a power-driven vise stand

02.014 Cut copper tubing or pipe with a hacksaw

02.015 Cut copper tubing or pipe with a tubing cutter

02.016 Bend copper tubing or pipe with a spring bender

02.017 Join copper tubing or pipe to copper tubing or pipe

02.018 Join copper tubing to brass pipe

02.019 Join copper tubing with a compressed connector

02.020 Join copper tubing to steel pipe

02.021 Join copper tubing or pipe to plastic pipe using the sweat method

02.022 Join copper tubing or pipe to plastic pipe

02.023 Join cast-iron soil pipe using lead and oakum

02.024 Cut cast-iron soil pipe with a snap-type chain cutter

02.025 Join cast-iron soil pipe with a hubless or band-clamp coupling

02.026 Join steel pipe to cast-iron pipe with a hubless coupling

02.027 Join plastic pipe to cast-iron pipe with a hubless coupling

02.028 Braze pipe with a gas torch and filler metal

02.029 Weld pipe with an oxyacetylene torch and filler metal

02.030 Join pipe with an electric arc welder and filler metal

03.0 READ AND INTERPRET BLUEPRINTS AND SPECIFICATIONS—The student will be able to:

03.001 Apply basic math skills

03.002 Read and interpret an architect's scale

03.003 Read and interpret a 6-foot rule

03.004 Recognize and identify basic plumbing symbols

03.005 Explain the basic theory and principles of isometrics

03.006 Select fixtures

04.0 LAY OUT A JOB—The student will be able to:

04.001 Determine a materials list

04.002 Select material specifications

05.0 INSTALL FIRST ROUGH (UNDERGROUND)—The student will be able to:

05.001 Lay out a job on site

05.002 Install building drain, waste, and vent systems

05.003 Install distribution systems

05.004 Install water service

05.005 Install building sewer/septic tanks and/or approved sewer systems

05.006 Test the first rough

06.0 INSTALL SECOND ROUGH (FIRST FLOOR AND ABOVE)—The student will be able to:

06.001 Lay out a job on site

06.002 Install hangers and supports

06.003 Install building drain, waste and vent systems

06.004 Install water distribution systems

06.005 Test the second rough

07.0 TRIM OUT PLUMBING—The student will be able to:

07.001 Distribute and place fixtures and appliances

07.002 Install and trim out fixtures

07.003 Install closet flanges

07.004 Install speed stops on water pipes

07.005 Trim out a lavatory

07.006 Trim out water closets

07.007 Trim out bath tubs

07.008 Trim out showers

07.009 Trim out kitchen sinks

07.010 Trim out washing machine drains and piping

07.011 Install garbage disposals

07.012 Hook up ice makers

07.013 Install and trim out water heaters

07.014 Install and hook up dishwashers

07.015 Test and inspect the final installation

07.016 Conduct purification tests

08.0 REPAIR, SERVICE, AND MAINTAIN PLUMBING SYSTEMS—The student will be able to:

08.001 Establish positive customer relations

08.002 Troubleshoot and diagnose systems

08.003 Isolate problems

08.004 Determine alternative solutions

08.005 Obtain decisions from customers

08.006 Repair sewer mains

08.007 Repair water mains

08.008 Repair water closet seats, ball cocks, flush valves, floats, lift rods, ball stoppers, and trip levers

08.009 Repair leaks in traps

08.010 Repair leaks in faucets

08.011 Install sink strainers

08.012 Install heater elements

08.013 Replace or repair fixture water-supply pipes

08.014 Reseal toilets to flanges

08.015 Test and inspect repaired systems

08.016 Explain the nature of the problem(s), remedial action(s) needed, and advise the customer on preventive maintenance

08.017 Prepare a job ticket

08.018 Price a job and write the invoice

08.019 Collect for services rendered

09.0 DEMONSTRATE EMPLOYABILITY SKILLS--The student will be able to:

09.001 List sources of job openings other than public or private employment agencies

09.002 Write a letter of application for a job

09.003 Prepare a resume or personal fact sheet

09.004 List factors to consider when applying for a job

09.005 List ways of making contact with employers

09.006 Identify documents which may be required when applying for a job interview

09.007 Complete a job application form correctly

09.008 Identify appropriate dress and grooming for a job interview

09.009 Classify behaviors considered to be appropriate in a job interview situation

09.010 Describe advantages to the employer and employee of being a productive worker

09.011 Explain the purpose of supervision, self-discipline, and performance evaluation

09.012 Identify appropriate response(s) to criticism from employer, supervisor, or other employees

09.013 List consequences of frequently being absent from the job

09.014 List consequences of frequently arriving late for work

09.015 List factors to consider when resigning from a job

09.016 Write a letter of resignation

DRAFT RECOMMENDATIONS AS OF 1/1/86

CURRICULUM FRAMEWORK PROGRAM AREA: Industrial

FLORIDA DEPARTMENT OF EDUCATION EFFECTIVE DATE: July, 1986

PROGRAM TITLE: Residential and Commercial Plumbing

CODE NUMBER: Secondary ________ Postsecondary BCT0580

Florida CIP IN46.050300

SECONDARY SCHOOL CREDITS _____ COLLEGE CREDITS _____ POSTSECONDARY ADULT VOCATIONAL CREDITS ________

APPLICABLE LEVELS(S): ___7-9 ___9-12 ____ Postsecondary Adult Vocational

___Postsecondary Vocational x Other 13-17

CERTIFICATION COVERAGE: TEC CONSTR @ 7 BUILDING CONST @ 7 PLUMBIN 7

I. MAJOR CONCEPTS/CONTENT: The purpose of this program is to prepare students for employment as plumbers (862.381-030), pipe fitters (862.261-010), construction laborers (862.684-014), pipe fitter helpers (862.684-022), plumbing assembler-installers (862.684-026), and lawn-sprinkler installers (869.684-030), or to provide supplemental training for persons previously or currently employed in these occupations.

The content includes, but is not limited to, communication skills, leadership skills, human relations and employability skills, safe and efficient work practices, and the assembly, installation, and repair of pipes, fittings, and fixtures for heating, water, and drainage systems according to specifications and plumbing codes.

II. LABORATORY ACTIVITIES: Shop or laboratory activities are an integral part of this program and provide instruction in the use of plumbing tools to lay out, build, test, and maintain plumbing systems in both residential and commercial applications.

III. SPECIAL NOTE: The Vocational Industrial Clubs of America, Inc., is an appropriate vocational student organization for providing leadership training experiences and reinforcing specific vocational skills. When provided, these activities are considered an integral part of this instructional program.

The cooperative method of instruction may be utilized for this program. Whenever the cooperative method is offered, the following is required for each student: a training plan which includes instructional objectives and a list of on-the-job and in-school learning experiences; a work station which reflects equipment, skills and tasks relevant to the occupation the student has chosen as a career goal.

In accordance with Section 240.149 F.S., the minimum basic skills grade level required for this postsecondary adult vocational program is: Mathematics 7.0, Language 7.0. This grade level number corresponds to a grade equivalent score obtained on a state designated basic skills examination.

The typical length of this program for the average achieving student is 1800 contact hours (2160 clock hours).

IV. INTENDED OUTCOMES: After sucessfully completing this program, the individual will be able to:

01. Perform basic plumbing skills
02. Join pipe
03. Read and interpret blueprints and specifications
04. Lay out a job
05. Install first rough (underground)
06. Install second rough (first floor and above)
07. Trim out plumbing
08. Repair, service, and maintain plumbing systems
09. Demonstrate knowledge of plumbing codes
10. Install domestic hot water heating and circulating systems
11. Install hot water/steam heating systems
12. Select and install insulation
13. Locate and lay out utilities installations (water mains, sanitary sewers, storm sewers, gas mains)
14. Lay out septic tank systems
15. Install interceptors and separators
16. Install gas and fuel pipe
17. Install irrigation systems

18. Install roof drains and leaders
19. Install solar heating systems (optional)
20. Demonstrate employability skills

STUDENT PERFORMANCE STANDARDS

RESIDENTIAL and COMMERCIAL PLUMBING

01.0 PERFORM BASIC PLUMBING SKILLS--The student will be able to:

01.001 Comply with shop policies and procedures
01.002 Explain the basic theory and principles of plumbing
01.003 Identify and use hand tools
01.004 Identify equipment and safety hazards
01.005 Apply safety procedures
01.006 Identify pipe fittings
01.007 Identify pipe joining methods
01.008 Identify plumbing fixtures and appliances
01.009 Read and interpret and comply with manufacturers' schematics and specifications
01.010 Find information in technical literature
01.011 Give reports orally and in writing
01.012 Listen to and comply with oral and written instructions

02.0 JOIN PIPE--The student will be able to:

02.001 Wipe a clay pipe joint
02.002 Join clay pipe with a pipe coupling

02.003 Join cast-iron pipe to clay sewer pipe

02.004 Join plastic pipe using the adapter-solvent cement method

02.005 Cut concrete pipe

02.006 Bend steel pipe with a heavy-duty bending tool

02.007 Bend steel pipe with a chain vise and torch

02.008 Cut steel pipe with a one-wheel steel pipe cutter

02.009 Cut steel pipe with a four-wheel steel pipe cutter

02.010 Join plastic pipe to steel pipe

02.011 Thread steel pipe with an adjustable diestock

02.012 Thread steel pipe with a nonadjustable diestock

02.013 Thread steel pipe with a power-driven vise stand

02.014 Cut copper tubing or pipe with a hacksaw

02.015 Cut copper tubing or pipe with a tubing cutter

02.016 Bend copper tubing or pipe with a spring bender

02.017 Join copper tubing or pipe to copper tubing or pipe

02.018 Join copper tubing to brass pipe

02.019 Join copper tubing with a compressed connector

02.020 Join copper tubing to steel pipe

02.021 Join copper tubing or pipe to plastic pipe using the sweat method

02.022 Join copper tubing or pipe to plastic pipe

02.023 Join cast-iron soil pipe using lead and oakum

02.024 Cut cast-iron soil pipe with a snap-type chain cutter

02.025 Join cast-iron soil pipe with a hubless or band-clamp coupling

02.026 Join steel pipe to cast-iron pipe with a hubless coupling

02.027 Join plastic pipe to cast-iron pipe with a hubless coupling

02.028 Braze pipe with a gas torch and filler metal

02.029 Weld pipe with an oxyacetylene torch and filler metal

02.030 Join pipe with an electric arc welder and filler metal

03.0 READ AND INTERPRET BLUEPRINTS AND SPECIFICATIONS--The student will be able to:

03.001 Apply basic math skills

03.002 Read and interpret an architect's scale

03.003 Read and interpret a 6-foot rule

03.004 Recognize and identify basic plumbing symbols

03.005 Explain the basic theory and principles of isometrics

03.006 Select fixtures

04.0 LAY OUT A JOB--The student will be able to:

04.001 Determine a materials list

04.002 Select material specifications

05.0 INSTALL FIRST ROUGH (UNDERGROUND)--The student will be able to:

05.001 Lay out a job on site

05.002 Install building drain, waste, and vent systems

05.003 Install distribution systems

05.004 Install water service

05.005 Install building sewer/septic tanks and/or approved sewer systems

05.006 Test the first rough

06.0 INSTALL SECOND ROUGH (FIRST FLOOR AND ABOVE)—The student will be able to:

06.001 Lay out a job on site

06.002 Install hangers and supports

06.003 Install building drain, waste and vent systems

06.004 Install water distribution systems

06.005 Test the second rough

07.0 TRIM OUT PLUMBING—The student will be able to:

07.001 Distribute and place fixtures and appliances

07.002 Install and trim out fixtures

07.003 Install closet flanges

07.004 Install speed stops on water pipes

07.005 Trim out a lavatory

07.006 Trim out water closets

07.007 Trim out bath tubs

07.008 Trim out showers

07.009 Trim out kitchen sinks

07.010 Trim out washing machine drains and piping

07.011 Install garbage disposals

07.012 Hook up ice makers

07.013 Install and trim out water heaters

07.014 Install and hook up dishwashers

07.015 Test and inspect the final installation

07.016 Conduct purification tests

08.0 REPAIR, SERVICE, AND MAINTAIN PLUMBING SYSTEMS--The student will be able to:

08.001 Establish positive customer relations

08.002 Troubleshoot and diagnose systems

08.003 Isolate problems

08.004 Determine alternative solutions

08.005 Obtain decisions from customers

08.006 Repair sewer mains

08.007 Repair water mains

08.008 Repair water closet seats, ball cocks, flush valves, floats, lift rods, ball stoppers, and trip levers

08.009 Repair leaks in traps

08.010 Repair leaks in faucets

08.011 Install sink strainers

08.012 Install heater elements

08.013 Replace or repair fixture water-supply pipes

08.014 Reseal toilets to flanges

08.015 Test and inspect repaired systems

08.016 Explain the nature of the problem(s), remedial action(s) needed, and advise the customer on preventive maintenance

08.017 Prepare a job ticket

08.018 Price a job and write the invoice

08.019 Collect for services rendered

09.0 DEMONSTRATE KNOWLEDGE OF PLUMBING CODES—The student will be able to:

09.001 Describe and explain the purpose of plumbing codes

09.002 Apply basic theory and principles of plumbing in relation to the codes

09.003 Read and locate information in the Plumbing Code

09.004 Explain and define terminology used in the Code

09.005 Explain why the Code may supercede manufacturer's specifications on products

10.0 INSTALL DOMESTIC HOT WATER HEATING AND CIRCULATING SYSTEMS--The student will be able to:

10.001 Explain the basic theory of domestic hot water heating and circulating systems
10.002 Design, size, and lay out a system
10.003 Select equipment and materials in accordance with job specifications
10.004 Lay out a job on site
10.005 Install distribution systems
10.006 Apply insulation
10.007 Install hot water heaters or boilers
10.008 Install equipment controls
10.009 Install safety devices
10.010 Test, balance, and inspect the final heating installation
10.011 Balance and adjust controls

11.0 INSTALL HOT WATER/STEAM HEATING SYSTEMS--The student will be able to:

11.001 Explain the basic theory and principles of hot water and steam heating systems
11.002 Apply safety procedures
11.003 Identify special materials
11.004 Lay out a job on site
11.005 Install distribution systems

11.006 Apply insulation

11.007 Install hot water or steam generators or boilers

11.008 Install controls

11.009 Install safety devices

11.010 Install terminal devices (radiators, steam tables, etc.)

11.011 Test, balance, and inspect the final heating installation

11.012 Balance and adjust controls

12.0 SELECT AND INSTALL INSULATION—The student will be able to:

12.001 Explain the basic theory of insulation

12.002 Select materials in accordance with job specifications

12.003 Explain the different methods of applying insulation

13.0 LOCATE AND LAY OUT UTILITIES INSTALLATIONS (WATER MAINS, SANITARY SEWERS, STORM SEWERS, GAS MAINS)—The student will be able to:

13.001 Check for conflict with other utilities

13.002 Explain the basic standards used in the installation of all utilities

13.003 Interpret and locate utilities in accordance with a site plan

13.004 Identify special materials and procedures

13.005 Explain methods of tapping and connecting to mains

13.006 Explain the application of pumping systems to mains

13.007 Explain the need for as-built drawings and records

13.008 Explain the application of OSHA and other safety regulations

13.009 Explain the importance of integrating each utility system so as to avoid crossconnecting

14.0 LAY OUT SEPTIC TANK SYSTEMS—The student will be able to:

14.001 Explain the theory and function of a septic tank system

14.002 Identify and explain the uses of various components of a septic tank system

14.003 Explain the procedures of soil percolation and the obtaining of permits and approvals

15.0 INSTALL INTERCEPTORS AND SEPARATORS—The student will be able to:

15.001 Identify the various types of interceptors and separators

15.002 Explain the theory and function of various interceptors and separators

15.003 Install and maintain lint traps

15.004 Install and maintain grease traps

15.005 Install and maintain gas and oil separators

15.006 Install and maintain sand and sediment interceptors

16.0 INSTALL GAS AND FUEL PIPE--The student will be able to:

16.001 Explain the importance of safety in the design and installation of gas systems and components (controlled by AGA)

16.002 Design, size, and lay out a system in accordance with AGA standards

16.003 Select materials in accordance with specifications

16.004 Lay out a job on site

16.005 Install distribution systems

16.006 Install equipment and controls

16.007 Install safety devices

16.008 Test and inspect installed systems

17.0 INSTALL IRRIGATION SYSTEMS--The student will be able to:

17.001 Explain the theory and procedures of landscape and commercial irrigation systems

17.002 Design, size, and lay out a landscape and/or commercial irrigation system

17.003 Select materials in accordance with given specifications

17.004 Lay out a job on site

17.005 Install distribution systems

17.006 Install equipment and controls

17.007 Test and inspect systems

18.0 INSTALL ROOF DRAINS AND LEADERS--The student will be able to:

18.001 Explain the theory of roof drains and leaders

18.002 Design, size and lay out systems

18.003 Select materials in accordance with specifications

18.004 Lay out a job on site

18.005 Install distribution systems

18.006 Install the roof drains and leaders

18.007 Test and inspect systems

19.0 INSTALL SOLAR HEATING SYSTEMS (OPTIONAL)--The student will be able to:

19.001 Explain the history and theory of solar heating

19.002 Identify various solar heating applications

19.003 Identify various materials used in solar heating

19.004 Design domestic solar water heating systems

19.005 Choose materials for domestic solar water heating systems

19.006 Lay out a job on site

19.007 Install transmission lines and low-voltage wiring

19.008 Install storage tanks

19.009 Install controls

19.010 Install safety devices

19.011 Install solar panels

19.012 Install controls at panels

19.013 Install safety devices at panels

19.014 Fill and test systems

19.015 Operate systems and adjust controls

19.016 Explain the operation and maintenance of systems to others, including freezing precautions

20.0 DEMONSTRATE EMPLOYABILITY SKILLS—The student will be able to:

20.001 List sources of job openings other than public or private employment agencies

20.002 Write a letter of application for a job

20.003 Prepare a resume or personal fact sheet

20.004 List factors to consider when applying for a job

20.005 List ways of making contact with employers

20.006 Identify documents which may be required when applying for a job interview

20.007 Complete a job application form correctly

20.008 Identify appropriate dress and grooming for a job interview

20.009 Classify behaviors considered to be appropriate in a job interview situation

20.010 Describe advantages to the employer and employee of being a productive worker

20.011 Explain the purpose of supervision, self-discipline, and performance evaluation

20.012 Identify appropriate response(s) to criticism from employer, supervisor, or other employees

20.013 List consequences of frequently being absent from the job

20.014 List consequences of frequently arriving late for work

20.015 List factors to consider when resigning from a job

20.016 Write a letter of resignation

INSTRUCTIONAL APPROACH

Local decisions must be made by school administrators & teachers concerning the appropriate methods to use to deliver instruction & measure student achievement. In many instances, a mix of various instructional approaches may be deemed appropriate to present instruction in a comprehensive and efficient manner. It is the teacher's responsibility to ensure that students learn how to competently perform the tasks specified in the course objectives. The teacher must lead the students through the learning experiences in a course. This leadership role requires the teacher to motivate students to aggressively pursue learning activities. The teacher must select the methods of instruction that best apply to the students ability levels and that allow the teacher to control the learning processes, to measure student achievement, and to provide feedback to the student.

KEY FACTORS TO CONSIDER

—Student Characteristics

Adolescent - Immature students need constant control, a high degree of motivational leadership, and relatively simple learning activities.

Adult - Mature students are more often self-motivated, need less control, and can accept complex learning activities.

Prerequisites - Can the student read, write, calculate mathmatics, and understand English language at the ability level required to complete learning activities.

—Teacher Characteristics

Subject Knowledge - The teacher must be a subject matter expert—must be able to teach instructional concepts and evaluate student performance. Should have significant amount of experience actually working in industry/vocational area.

Instructional Delivery - The teacher must motivate and lead the student as well as know how to organize and present various types of instruction. Innovative instructional methods should not be attempted if the instructor is not qualified to use them.

Instructional Development - Teachers must select materials, and often develop their own materials, to be used by students. The materials used must support the methods of delivery. The teacher must be qualified to select and develop course materials, or else use instructional packages developed by other qualified sources.

Instructional Measurement - Teachers must select testing methods that support the instructional delivery system used. Teachers must be qualified to develop, administer, and evaluate both written and performance type tests.

—Instructional Setting Characteristics

Time Constraints - Traditional methods of instruction in school systems are controlled by the time periods available. Instruction must be made to fit the time available for training unless the time constraints are removed. If time constraints are not a factor, innovative methods of instruction may be appropriate such as:

- open-entry/open-exit
- self-paced/independent study
- computer based instruction

- competency based instruction

Facilities and Equipment - Instructional methods selected must take into consideration the space available, the number of work stations for students and the amount of tools and equipment available for student use.

CONVENTIONAL INSTRUCTIONAL METHODS:

Any given course of instruction may require some instruction to be presented in a standard lecture or controlled demonstration format. These methods of instruction can be easily combined with instructor controlled step-by-step practical exercises. Some instructional activities may dictate that this instructional approach be used to introduce students to hazardous equipment often utilized in vocational training. In most situations, students should be required to perform specified activities to achieve skill competency. If mastery of a task is required, competency-based education methods may be more appropriate. If the training activity envolves an orientation or a seldom performed nonessential task, conventional instructional methods are acceptable.

COMPETENCY-BASED VOCATIONAL EDUCATION INSTRUCTIONAL METHODS:

The focus of Competency-based Vocational Education (CBVE) is to ensure that each student can competently perform tasks specified in an objective statement. Competency-based instruction can be included in conventional instructional settings as well as innovative settings. CBVE does not require self-paced/individualized methods of instructional delivery to be used as the only means for CBVE instruction.

CBVE PRINCIPLES AND CHARACTERISTICS

1. The curriculum is based on well defined, job related tasks or competencies. The curriculum should be designed to have students do things, not just read resources, or view AV materials.

2. Each period or unit of instruction contains a performance objective, stated in terms of observable, measurable activities.

3. Teachers provide students with a list of the performance objectives, the standards to be met and other performance criteria.

4. Teachers may utilize any appropriate method of instruction to present the subject matter to students. Teachers can mix various methods together in any given program, or course, or unit of instruction, to achieve the most efficient means for the students to learn the subject matter and competently perform the task as specified in the objective. Possible methods of instruction used in CBVE programs may include:
   - —Group paced lectures and demonstrations.
   - —Instructor controlled practice activities.
   - —Self-paced instruction for individual learning activities and repeated practice.
   - —Small group or team teaching methods where several students work together on a piece of equipment or a project, or activity.

5. Teachers must have a method of recording each student's achievement for each performance objective. This can be in the form of a record book, or a progress chart, a check off sheet, or a series of well planned performance tests.

6. Teachers must inform each student that they have either met the criteria specified for each performance objective or they have not adequately performed the task. The student must be informed of any inadequate performance and provided the opportunity and resources to practice performing the task until adequate performance is attained. This is probably the most difficult aspect of managing CBVE instruction, for it requires the teacher to individually coach or tutor a student for a controlled period of time, requiring the student to practice performing the task several times, and ultimately making the decision that the student is either competent at the task or not competent. The teacher may limit the time allowed for repeated task practice.

7. Student performance is evaluated in comparison to the standards and performance criteria stated in the objective, not to the performances of other students. If performance meets the standard, the student passes the objective 100%. If the student does not meet all the criteria specified, the student is not 100% competent in performance of the task and should not be given credit for completing the task. The student can be given an incomplete grade if continued attempts will be made to pass the objective.

8. Teachers may use both performance tests and written tests to determine competency. Written tests can be used to measure knowledge of performance procedures, equipment identification, math and science abilities, etc. Performance tests can be used for actual student performance of a task, to a prescribed standard, under specified conditions.

CBVE GOALS

The goal of Competency-Based Vocational Education is to have all students reach the specified standard of competency. Instructional methods, quantity of instruction, and performance evaluation methods will vary according to the instructional situation. CBVE instruction allows for the use of a multitude of instructional resources and procedures, including individual self-paced units of instruction to allow the student to master the objective. This approach differs from traditional instruction in which all students use the same materials and spend the same amount of time in a course where student achievement is expected to vary—not the instructional approach.

TEACHER AND STUDENT ROLES IN CBVE

The requirements of competency-based vocational education have major implications for the roles that teachers and students perform and for the kinds of skills that teachers need. In competency-based settings, teachers must not only be dispensers of information; but they must also become managers of a variety of instructional resources that they select and use to tailor instruction to the needs of individual learners. Teachers spend less time providing content information and much more time helping individuals master objectives. In a competency-based setting, the teacher may present some group instruction as well as develop alternative resources, and function as a tutor and a counselor, a diagnostician of learner needs, a prescriber of instructional experience, and an evaluator of competent performance.

The teacher in this setting has, then, a more complex, varied, and rewarding role than ever before. Teachers need to be able to design their course or programs around measureable, job-related skills and to ensure that these skills are, indeed, necessary for obtaining and keeping a job. They must be able to state objectives clearly and in a way that permits objective measurement. Teachers must be able to carry out this measurement in a way that accurately assesses student achievement and that exactly reflects what the competency really involves.

Teachers must also be able to adapt their instruction to individual learning needs so that each student can acquire the competencies (s)he needs. This ability to tailor instruction demands knowledge of a wide variety of individualization strategies, as well as skill in applying these strategies systematically.

A major assumption underlying CBVE is that students who are actively involved in carrying out their programs of study will learn more and retain more than students who passively accept information fed to them. Thus, an important part of the teacher's job is to encourage students to assume more and more responsibility for their own learning.

Because students are doing many different kinds of things, and because the teacher must coordinate the activities of all the students in a course, the individual student's role inevitably involves more responsibility than it does in traditional settings.

Many of the basic management tasks that teachers formerly undertook by themselves-tasks such as record keeping, monitoring student progress, and monitoring the use of resources-must become the joint responsibility of teachers and students in a competency-based setting.

Some teachers worry that giving students more responsibility will result in a loss of teacher control. On the contrary, however, most teachers find that the have more control in a competency-based setting than in a traditional, group-oriented setting. The teacher has, after all, designed the system or environment in which students must operate; without the teacher there to manage the overall system, it would soon cease to function.

INSTRUCTIONAL CONCEPTS:

Instruction should be systematic and reflect program goals. A list of competencies and specific performance objectives with criterion-referenced measures should be used.

1. Program Plan

   The training program should progress in logical steps and provide for alternate sequences, where applicable.

2. Student training plan

   A training plan for each student should be used, indicating the student's training goal(s) and specific steps needed to meet each goal. Every student should be given a copy of his/her training plan.

3. Preparation Time

   Adequate time should be provided for teacher preparation and program development and/or modification.

4. **Teaching Load**

The instructor/student ratio and class contact hours should allow time for interaction on a small-group and a one-to-one basis.

5. **Curriculum**

   a. The specific competencies in the Career MAP Competency List should be included in each area of program-specific instruction. Additional competencies may be added to meet the needs of local employers. All additional competencies should be approved by the program advisory committee.

   b. Instructions on the legal aspects and responsibilities in areas such as Environmental Protection Agency regulations, safety regulations, OSHA regulations, and other appropriate requirements should be included in the curriculum. Instruction and practice in filling out work order forms, ordering parts or supplies, and basic record-keeping should be a part of the training program.

6. **Student Progress**

A record of each student's progress should be maintained through use of the Career MAP or another type of Progress Chart. The record should indicate the competencies required for mastery and those competencies the student has mastered.

7. **Performance Standards**

Instruction should be performance based, with an acceptable perfomace standard stated for each task. These standards should be shared with students and potential employers.

Students should demonstrate "hands on competency" or "mastery" of a competency before the instructor verifies the student's performance.

8. **Safety Standards**

Safety instruction must be given prior to shop work and be an integral part of the training program. A safety test must be included in the training program. Eye protection must be worn in any shop/lab area, when required.

9. **Personal Characteristics**

All training activities and instructional material should emphasize the importance of maintaining high personal characteristics. Employability skills training and evaluation should be integrated throughout the training program.

10. **Provisions for Individual Difference**

The training program should be structured in such a manner that students with different levels of cognitive and psychomotor skills can be accomodated.

11. **Related Instruction**

Instruction in related mathematics, communication, and interpersonal relations should be provided and coordinated with ongoing instruction in the training program. This instruction should be provided by a qualified instructor.

12. **Testing**

Both written and performance-based tests must be used to validate student competency. Students should be encouraged to take certification tests that are publicly recognized indicators of capabilities.

COURSE OUTLINE/SAMPLE LESSON PLAN

Units of instruction used by Vocational Education teachers must be correlated to the Curriculum Frameworks, and Student Performance Standards. The Curriculum Framework provides the basis for developing the course outline. Each school should utilize the resources and modules that apply to the scope of their program and the various methods of instruction their situation dictates.

Teachers may develop their individual course outlines using the resources and instructional material contained in the last section of this guide. They may also develop their own units of instruction as they feel may be necessary to meet the intended outcomes stipulated in the Curriculum Framework. The number and order of presentation of the modules can be varied to fit the objectives of the course.

For example, a school may elect to go into depth in only a few of the modules, or it may decide to cover a wider range of modules but in less depth. This program can be offered for a single semester or for two or more semesters, depending upon the local situation. A student should not be given credit for enrolling in the same component of instruction more than one time.

SAMPLE COURSE OUTLINE

Vocational teachers should prepare a comprehensive outline of subjects to study for each course they teach. Each student should be provided a copy of the course outline. Teachers may use any format they desire for the outline, and should include the following information on the course outline.

Recommended Course Outline Contents

1. Course name.
2. Course number (state directory number and/or local number).
3. Course start date or individual start date.
4. Identification of time periods for study if applicable.
5. Identification of place or room/facility for study or practical work.
6. Identification of teacher/instructor/assistants responsible for instruction and/or evaluation.
7. Identification of units or subjects to study (objectives) or competencies, etc., including Task # or Duty #.
8. Identification of primary resources or references available to study.
9. Identification of major practical exercise work, projects, or activities to perform.
10. Identification of major tests or examinations to be administered.

SAMPLE COURSE OUTLINE FORMAT

Course Name ______________________

Course Number ______________________

Course Dates ______________________

Instruction unit or period	Duty or Task # Module	Subject/ Objective/	location	Instructor	Reference

Lesson Plans/Teachers Guides & Student Guides

Teachers should prepare lesson plans or teachers guides & student guides for subjects on the course outline. Lesson plans are appropriate for traditional periods of instruction whereas teachers guides may be more appropriate for other types of instructional activities. Student learning guides may be used for traditional periods of instruction but they become a necessity for self-paced learning activities. Teachers guides contain all instructional information as well as tests & answer keys, whereas student learning guides contain only student information.

A sample student learning guide is provided in the following pages. This sample is an example of the material a teacher would provide students with for self-study in a competency-based course activity. Each page of the sample contains a different topic for the sake of illustration only. An actual student learning guide would be written around only one objective.

SCHOOL NAME & LOGO

A	Business Education	A STUDENT LEARNING GUIDE
B	TASK:	Write Letters Of Application
C	DUTY:	Applying For A Job
D	PURPOSE:	

A letter of application is your introduction to a potential employer. The purpose of this letter is to get an interview and a job. A prospective employee who can prepare effective application letters is one step ahead of the competition.

E

Dept.	Prog.	Duty	Task	Prereq.
BU	*	JA	02	JA-01

Each learning guide has a cover page like the sample above that contains the following items:

A. the name of the program

B. the task-a statement of exactly what you will be able to do or know when you complete the learning guide.

C. the duty-the broad unit in which this task is found.

D. the purpose-a statement of why it is important to attain the task.

E. identifying information such as department, program, duty, task, and prerequisite. The prequisite in the box on the far right tells you that you must have already attained the task identified there before proceeding to attain the one in the present learning guide.

STUDENT PERFORMANCE OBJECTIVES:

A **TERMINAL PERFORMANCE OBJECTIVE:**

B **GIVEN:** plans and a residential site.

C **YOU WILL:** construct and set forms for a continuous footing.

D **HOW WELL:** You must successfully complete the Written Test and score 100% on the Performance Test.

ENABLING OBJECTIVES:

1. Identify styles, uses and parts of forms.
2. Prepare for constructing continuous footings.
3. At a school work station, construct and set forms for a continuous footing.

E

Dept.	Prog.	Duty	Task
IN	9163	F	01

The student performance objective page, similar to the sample you see above, contains the following information:

A. the terminal performance objective (TPO)-the broad heading that encompasses the three items beneath it and states in detail what will be expected of you at the end of the learning guide

B. the given-a statement of what will be provided when you take the written or performance test

C. the you will-a statement of what will be required to attain the task

D. the how well-a statement of the degree of performance excellency required to attain the task

E. the enabling objectives (EO's)-the steps to be taken in attaining the task

A ENABLING OBJECTIVE NO. _2_

B Disassemble fuel injector and inspect parts.

C

LEARNING STEPS	RESOURCES
1. Disassemble injector.	1. a. Needle valve injector b. Mechanic' tool set c. Injector tools
2. When completed, evaluate your work using the Self-check.	2. Self-Check enclosed
3. Have instructor evaluate your recordings.	3. Instructor
4. Go on to Enabling Objective No.3.	

E

Dept.	Prog.	Duty	Task	EN.OBJ.
IN	9123	C	05	2

The enabling objectives are the heart of the learning guide. They provide detailed steps of what to do and when to do it.

There is an enabling objective page for each EO listed on the student performance objective page. The EO page resembles the sample above, and contains the following information:

A. the number of the EO being learned

B. a restatement of the EO as it appeared in the student performance objective

C. the learning steps-they tell you what to do

D. the resources-they tell you what items you will need to complete the steps

INSTRUCTION SHEET

Mounting Tires

Follow the procedure below for mounting a tire on a rim. Pay close attention to all safety precautions.

CAUTION: WEAR SAFETY GLASSES AT ALL TIMES!

1. Visually inspect tire for any wear or damage.
2. Place the rim on the changer with the narrowest flange up — hand tighten centering cone.
3. Lubricate bead of tire with soap solution.
4. Place tire in position on the rim with as much bead over the rim flange as possible. This provides a starting position for bead lifting tool.
5. Attach the air hose for inflating the tire.

CAUTION: KEEP THE HANDS AND BODY AWAY FROM TIRE WHILE INFLATING. IF THE TIRE SHOULD EXPLODE YOU COULD BE INJURED!

Dept.	Prog.	Duty	Task	En Obj
IN	9043	B	02	2

The procedure in using the EO page is to follow each learning step in sequence. The first several learning steps will tell you to read or view particular resources identified to the right of the step (see #2 on the sample EO page). Other learning steps will ask you to practice or apply the knowledge or skill (see #3 on the sample). Another learning step will identify the type of feedback used in evaluating the skill or knowledge called for in the EO. Often this is a self-check (see #4 on the sample). Some learning guides will have instruction sheets on the order of the above sample.

SELF-CHECK

DIRECTIONS

Evaluate your work using the items listed below. All items should receive a "yes" response.

	YES	NO
1. Was the stocked area layed out with a pencil and chalk line?.....................	___	___
2. Did each end of the stock area begin with a stack of blocks?........................	___	___
3. Was the line hung on the left lead first?...	___	___
4. Was the line hung in 45 seconds?...........	___	___

If you received a "no" response for any item, go back and repeat one or more of the Learning Steps for this Enabling Objective.

Dept.	Prog.	Duty	Task	En Obj.
IN	9133	B	18	2

The self-check gives you immediate feedback on how well your learning is progressing.

WRITTEN TEST FOR TASK NO. ____

TASK: Demonstrate and use Ohm's Law

Directions

The purpose of this test is to determine if you fully understand how to demonstrate and use Ohm's Law. To successfully complete this test, all items must be answered correctly.

The items below are Multiple Choice. On the separate answer sheet, put the letter of the correct answer in the blank to the left of the number of the question.

Multiple Choice Question

____ 1. According to accepted theory, electric current is:
   a. the electron at rest.
   b. the flow of electrons.
   c. the movement of atoms.
   d. the movement of protons.

____ 2. The ohm is the unit of electrical:
   a. current.
   b. voltage.
   c. pressure.
   d. resistance.

Dept.	Prog.	Duty	Task
IN	9273	B	02

PERFORMANCE TEST FOR TASK NO._____

TASK:	Perform Cash Transactions

__________________________ STUDENT'S NAME

________________ DATE

DIRECTIONS TO STUDENT: In a store situation, you will set up a till and place the currency in the proper place. You will be evaluated for attainment of this task, based upon the items listed below.

ITEM NO.	ITEMS TO BE EVALUATED: For successful attainment ALL items must receive a "YES" Response.	YES	NO	
1.	Were all bills placed in the proper slot?........	...	..	.....
2.	Were all coins placed in the proper compartment?.	...	..	.....
3.	Was the work area cleaned?......................	...	..	.....

_____Score

___Attained

___Not Attained

Dept.	Prog.	Duty	Task	Attempt
DE	4623	C	03	

__________________________ EVALUATOR'S SIGNATURE

The performance test is always the last page of the learning guide. It may identify checkpoints of evaluation in the performance of skill, or it may list desirable characteristics of the finished product.

**Example of Student Learning Guides taken from : Learning at Ridge Vocational Technical Centers, State of Florida, Department of Education, Division of Vocational Education; June, 1980.

STUDENT ORGANIZATION PARTICIPATION

Vocational student organizations operate pursuant to federal and state laws, which authorize them as viable components of vocational education programs. According to federal regulations, the vocational education program of instruction may include activities of vocational student organizations which are an integral part of the vocational instruction offered and which are supervised by vocational education personnel. The Florida Board of Education Rules authorize vocational student organizations as an integral part of the vocational education program SBER 6A-6.64 (7) and 6A06.65 (8).

Vocational Student Organizations are operated throughout the Nation on the basis of legal endorsement, financial support, and active participation of federal, state and local levels of government as well as the civic and business communities.

Vocational Student Organization Activities are an integral part of the vocational curriculum in Florida. The organizations are designed to expand and enrich opportunities for leadership development, social awareness, civic responsibility, and vocational understanding.

Students who participate in the activities of a vocational student organization are better prepared to take their places in the world of work. They acquire firsthand knowledge of the many opportunities available in their chosen careers, and become aware of the value of their contributions to society.

Vocational student organizations provide opportunities for members to participate in activities which relate to actual or anticipated employment. Students develop and utilize their talents and abilities in ways that otherwise could not be available to them.

Vocational Industrial Clubs of America (VICA)

The Vocational Industrial Clubs of America (VICA) is an organization for students enrolled in trade, industrial, technical, and health occupations in high schools, area vocational-technical centers, and junior and community colleges.

VICA promotes high standards in work ethics, craftmanship, scholarship, and saftey while it fosters a deep respect for the dignity of work. In addition, the precepts of VICA help students relate school experiences to their search for meaning, identity, and achievement. A great deal of emphasis is placed on the functions of labor and management organizations, their interdependence, and their importance.

VICA members learn and develop skills in many different trades, including building, automotive, mechanical, heavy equipment, and electrical. In addition, students in such personal service occupations as cosmetology may be a part of VICA.

Prestige and recognition are offered to the VICA member through a local, regional, state, national, and international program of competition and

awards. Opportunities to develop personal leadership skills are provided through workshops and seminars while competitive activities help to develop the students' perspectives.
Membership in VICA helps students learn to work together and prepare for life through a continuing emphasis on the importance of each person's role as a contributing member of American society.

What is VICA?

VICA is an organization for students enrolled in fulltime secondary or post-secondary trade, industrial, or technical occupations education programs. It is the only national (and international) organization for trade and industrial students.

VICA gives every member a chance to learn, to enjoy the interaction with other students, to assist their schools and communities, and to grow and mature in qualities necessary to meet the challenges of the life ahead of them. VICA members are no different from other students except that they have found a way to make their formal training and education an enjoyable and rewarding experience. They're "turned on" to the satisfaction, rewards, and fun they have found in VICA.

VICA is the students' organization; the goals, purposes, and activities that relate to their own personal career goals and life interests. VICA is for students with a definite future in mind—people who can think with their minds and work with their hands, people who are proud of their work they do and want to learn to do it better. VICA is for those who want to develop as members of society, to learn to express themselves, to work with others, and to make contributions as individuals.

VICA is YOUR organization.
VICA is much more than contests.
VICA is training youth for leadership roles
  within their schools and communities.
VICA is instilling in youth the importance of participation,
  within their school, within their community and within the
  student organization.
VICA is also participation in leadership and skill areas.
A good VICA program gives Industrial Education programs
  high visibility.

Contests at the local-club level determine which students shall represent their school in regional competitions. Instructors should plan and conduct contests within their trade areas. This philosophy shall also prevail for leadership areas of emphasis. (Successful competitors at local school levels may, in school districts so desiring, compete within the district. THIS IS A SCHOOL DISTRICT OPTION.)

Successful competitors at the local school level compete at one of Florida's five regional contests. Successful competitors next compete at the state level. The state winners compete on the national level, in the United States Skill Olympics.

Competitors for the International Skill Olympics (ISO) are determined by a combination of leadership and skill abilities. The International Skill Olympics Committee establishes all rules and guidelines for the ISO.

The following additional criteria will be used in the selection of International contestants:

a. Overall citizenship—as demonstrated by attitude toward school, occupation, VICA, additional training, etc.

b. Evaluation of progress in skills and knowledge of trade, metric applications, print reading, and layout of problem.

c. Personal desire to represent VICA and the United States in international competition.

d. Willingness to make a commitment to VICA as to purpose of organization, code of conduct, preparation time, etc.

e. Contestant's self-reliance, basic intelligence, ability to follow instruction, maintain schedules, and adapt to last-minute changes.

Local VICA Organization

1. School Club

   Each school is one club (with one charter). A "school" shall be defined as one that appears with an assigned number in the current Florida Directory.

2. Chapters

   In the event that a school has a multiple sessions, each session shall be identified as a "chapter" (example- morning session identified as chapter #1, afternoon session chapter #2, evening session chapter #3, etc.).

3. Section

Each occupational program within each chapter shall be identified as a "section" (example- auto mechanics, welding, cosmetology, etc.).

Organizational Structure

Conducting a local club activity is the responsibility of every member. Every member must have a function to perform. A balanced organizational structure is necessary to equalize the workload as well as to pinpoint responsibility. When the students know what is expected of them, they can better use their abilities to plan and execute their own activities and , at the same time, grow in leadership ability. An effective organizational structure allows for the mixing of people and personalities, which is good human relations training.

It is a good idea to make a poster-size (or larger) organizational chart, to display it on the bulletin board, and to duplicate smaller copies of the chart so each member may have a copy. Members are less likely to shirk their responsibilities when all members are aware of everyone's assigned duties. Advisors must be careful to enforce the chain of command in all decisionmaking situations.

The national organizational structure shows the relationships of the local, state, and national organizations. It is important that every member understand just how the total organization functions. See VICA

Organizational Diagrams at Appendix B.

Intergrating VICA and Instruction

What is meant by the phrase "Integrating VICA and Instruction?" Some teachers feel that integrating VICA activities in between their instructional activities (in printing class, slotting VICA between a unit on the offset press and a unit on stripping) is best. Then there is always the teacher who says,"Look, nothing really happens Friday afternoons anyway, so I will slot VICA activities in on Friday afternoon. We will have our 5-minute VICA club meeting and that will satisfy the talk about integration of VICA activities into the instructional program."

This is not what we are talking about. We are talking about VICA being an integral part of everything that happens inside the classroom.

You may wish to secure and study the slide-tape program "Integrating VICA and Instruction" that is available from your Regional Program Consultant or Regional Program Advisor. You also may wish to purchase the set.

In-school instruction involves the organized presentation and application of knowledge, skills, and attitudes. Laboratory occupational experiences require the individual student to apply, in a simulated work setting, the knowledge, skills, and attitudes acquired through in-school instruction. VICA activities are part of in-school instruction and laboratory occupational experiences. Integrated club activities improve and tie together the existing curriculum.

VICA is specifically for Vocational Instruction Education. The activities of a chapter can be part of the learning experiences planned for any vocational class. Vocational education classes such as welding, foods, drafting, and auto mechanics can utilize VICA as a teaching tool. Any student who is enrolled in Vocational Industrial Education and meets membership requirements can be a member of a VICA club.

Job skills and procedures are often well defined and structured in the vocational programs. For example: in individual vocational courses, such skills as drawing to scale in drafting, tuning a motor in automobile mechanics, and keeping production records in a vocational printing course are taught. Although such skills are often taught at all levels in vocational education, the attitudes and values that promote employability and employment stability often are neglected parts of structured skill-oriented vocational programs. For example: learning experiences dealing with such activities as getting along with coworkers, accepting constructive criticism, or taking orders might not be as easily dealt with or integrated into skill-oriented, vocational courses. (See chart below.)

CLUB ACTIVITIES PROVIDE EXPERIENCE
THAT LEAD TO EMPLOYABLE
SKILLS AND ATTITUDES

1. Getting along with co-workers.
2. Respecting authority.

3. Accepting criticism.
4. Respecting the rights dignity of others.
5. Meeting deadlines.
6. Working with supervisors.
7. Taking directions.
8. Communicating clearly.
9. Taking initiative.
10. Being punctual.
11. Assuming responsibility.
12. ______________________________
13. ______________________________
14. ______________________________

Being an Effective Advisor

The effective advisor believes in student-directed learning, is organized, and is flexible in planning. The effective advisor works to become a respected person in the community, thereby building support for VICA activities. The effective advisor blends the classroom world with the "working" world and associations, and involves students with business, professional, and community leaders. The effective advisor promotes enthusiasm. For these efforts, the effective advisor receives a lifetime of psychological rewards.

The following club/classroom activities from the teacher/advisor viewpoint, should make being an advisor easier.

---

1. Advise and guide; do not dictate.
2. Positively assume that club activities are going to succeed. Know that club activities are strong teaching tools. Show enthusiasm.
3. Establish basic ground rules that help students to lead themselves. Hold meetings regularly and conduct meetings in a business-like manner.
4. Organize activities. Set up club files and a library of club-related materials.
5. Remember that club activities are individual and group activities and are NOT teacher activities.
6. Use students as class leaders.
7. Develop professional slide presentations about club work in classes.
8. Develop an informational packet to use with the community and other school personnel. Include such things as curriculum outlines, training plans, national headquarter promotions, calendars of work, etc.

Necessary Groundwork—Selling the VICA CLUB

Selling club activities to the department chairman, school administrators, and the community is an important first step in the organization of a club.

You may be told that there can be no clubs in the classroom and that few students join any more. Keep in mind that the VICA organization is not a club in the traditional sense. With ingenuity, a club can work in any situation in spite of rigid rules. Stress that VICA is INTEGRAL TO THE TOTAL PROGRAM AND SHOULD BE CONSIDERED A VERY IMPORTANT TEACHING TOOL IN AND OUT OF THE CLASSROOM/SHOP. Some suggestions on how to sell club-work are included below.

1. Discuss ideas. Don't spring the idea of an integrated club on people whose support will be needed.
2. Inform people about the state and national organizations by handing out and discussing promotional materials.
3. Make starting a VICA organization part of the agenda of the Craft Advisory Committee's meeting. Present your proposals to this group. Let the committee work with students to plan a program of activities.
4. Survey students on their interests in club activities. Compile and distribute results.
5. Check course outlines to see how club activities can fit in. Add these activities to lesson plans.
6. Relate the school philosophy to the national VICA Organization's goals, purposes, and program of activities.
7. Project the number of resource persons that students would contact in the community who would be up-to-date experts in certain areas.
8. Identify the club as an important public relations tool.
9. Show how club activities are important motivational projects

that promote student-directed learning.

10. If necessary, point out the benefits of club activities in relation to the relatively low cost-per-student.
11. Confer regularly with those in charge, i.e., department chairpersons, officers, and school administrators.

STUDENT ADMISSIONS CRITERIA

INTRODUCTION

Leading the individual student to successful completion of a vocational education program—in either a secondary or a post-secondary institution—should be the only major concern of a school's teaching effort. It is, therefore, of the utmost importance to direct thought, planning, and effort into identifying and selecting students with excellent potential for success in the educational program and in the industry. The school's primary task is to prepare people for full-time, entry-level positions as technicians or, in the case of those with more experience, as managers. Recruiting efforts will, of course, vary from school to school depending upon level (secondary or post-secondary), courses available, and local needs.

Students enrolled in an occupational cluster should be able to benefit from the instructional content therein with reasonable expectations for employment upon successful program completion.

In accordance with the Course Code Directory, an occupational program is offered to students at grade levels specified therein. The specific student admissions criteria required by the state and local education agencies are identified below.

SPECIFIC ADMISSIONS CRITERIA

	SECONDARY	POST-SECONDARY
Minimum age:	n/a	n/a
High School Diploma or GED Required:	no	yes
Physical Requirements:	none	none
Special Requirements:	none	none
* Minimum Basic Skills Math Level:	n/a	7.0
* Minimum Basic Skills Language Level:	n/a	7.0

*This grade level number is specified in the Curriculum Framework and is derived from a state basic skills examination.

In addition, attention should be focused on other personal qualities that, in theory, may be subject to improvement within a training program but, in reality, may prove to be serious impediments to success. Typical would be deficiencies in communications and mathematical skills. Such skills should be measured by tests and the results used as a screening guide or as a basis for providing additional program requirements.

THE STUDENT PROFILE

It is difficult to find an "ideal" student. Many will apply for a place in various training programs. The question is: How can students with the most potential for success be selected?

To attempt to draw a profile of the ideal student candidate would be fruitless because the ideal candidate cannot be defined in a manner that would fit all localities, nor even in such a way as to fit all situations in a single locality. Nevertheless, it is appropriate for the Craft Advisory Committee and the school system to develop a profile as a basic guide, with the certain knowledge that supplying candidates at any given time will necessarily entail compromise.

Rejecting high school students requesting admission to a vocational program would probably not be permitted in any school system in the nation. Even if students could be screened, it would be difficult to determine which would be successful. In a high school program, it may be best to accept as many students as possible and let their abilities surface in the first year or two. It may then be possible to place the strongest students in a vocational "capstone" course in their senior year, either for employment upon graduation or as a necessary prelude to admission to a post-secondary program. Obviously, this is not a perfect solution; but in the real world, perfection is rare.

The community college should make a greater effort to enroll the "ideal" student. This may be done through a process of screening "all comers" or by consciously recruiting potential students with known qualifications. In either case, the school and the Craft Advisory Committee will need to draw a profile of the desirable student. The profile will contain a list of qualities, traits, and aptitudes that combine to make a potentially successful candidate. Since few of these qualities are completely missing in any one person, acceptable levels must also be determined. The qualities deserving of highest attention—mechanical aptitude, for example, or native intelligence—are those which the educational program itself is unlikely to be able to change. Accordingly, such matters should carry considerable weight in establishing the basic profile. Other matters—deficiencies in mathematical or communications skills, for example—may lend themselves to improvement through related instruction, even though they are not parts of the training program per se. Following is a list of specific qualities the Advisory Committee and school staff should consider when establishing the student profile:

MECHANIC/TECHNICIAN—SERVICE

—Knowledge of basic tools and equipment used by mechanics/technicians

—Aptitude needed to think through and solve mechanical and technical problems;

—Ability to understand written mechanical/technical materials;

—Ability to interpret mechanical/technical drawings;

—Mechanical dexterity.

MECHANIC/TECHNICAL SERVICE MANAGEMENT

—Basic knowledge of service;

—Business skills;

—Ability to work with people;

—Communications skills;

—Leadership.

QUALIFYING AND PRETESTING

The process of qualifying a potential student for training must be an integral part of the recruiting process. Considerable amounts of time and money will be spent on students entering training. There must be some assurance that they are receptive to, and capable of benefitting from, the training that will be provided.

In the normal process of recruitment, recruiters will have some idea of the candidate's basic traits and capabilities. Whoever guides the candidate to the program will also have some knowledge of the person's interests, abilities, and experience. These perceptions should be considered by school admissions officials.

Care must be taken, however, to assure that highly favorable early-interview impressions—or negative impressions, for that matter—do not prejudice the final decision. Determination of the candidate's potential for success can be greatly aided by pre-school testing. Such tests can yield reliable clues to certain characteristics, such as mechanical aptitude, that are essential. The tests can also tell a great deal about the candidate's present knowledge and skills. These, in turn, can help determine how much and what kind of training each individual should receive.

Despite the efficacy of many tests, a caveat should be noted. Standardized testing has come under fire, in recent years, from many quarters. It has frequently been charged, for example, that some standardized tests are culturally biased and, consequently, favor one group in society over another. Those charged with responsibility for admissions should be aware that testing, while it can often provide valuable insights, should never be the sole criterion for admissions.

COUNSELING AND GUIDANCE

Counseling is a two-fold activity. Its first use is to guide the qualified, prospective student into the program; its second is to help the enrolled student on a continuing basis throughout the program.

Entry into a program does not cause all student problems to vanish; each student will encounter new problems as the program unfolds. The counselor's job is to work with the student to help identify problems and then work toward their solution. The counselor must also constantly watch for signs of discouragement or loss of interest and attempt to determine their causes.

Much day-to-day counseling will necessarily fall to the teacher. The teacher has the most contact with the student and is often in a position to detect and correct a problem while it is small. Overlap of responsibility between teacher and counselor should be apparent. The importance of working together in this critical area cannot be overstated.

The professional counselor cannot be expected to have the expertise of the teacher. The teacher will therefore provide much of the counseling that focuses on trade knowledge and skills. The counselor, on the other hand, will focus on the student's needs for advice on related instruction and in connection with personal growth, interests, and attitudes. In large programs, at least one counselor with deeper knowledge of the industry should be available.

STUDENT PLACEMENT

Placement will not be a factor with some students, such as those currently employed in the industry. A student from industry, even if in school by personal choice, is likely to have a good idea of where to go when the program is completed. The school placement program should, of course, be as available to these students as to anyone else.

The placement program, for the most part, will serve students who enter with little or no experience in, or contact with, the industry. Many such students will develop industry contacts during the course of instruction, particularly if a cooperative program is offered.

It is logical to center placement activity at the school. The school has an organized placement office for other occupations.

The tasks of the placement official is to fit graduating students to job openings in the community. Identifying graduating students is a simple task, but the placement official will also need to know something of each student's personal aims and interests in addition to what is on the achievement record. The placement official should develop a form that will provide this information in simple format for easy reference. The placement official, the counselor, and the teacher should assist students in the preparation of effective resumes.

Input concerning employment openings is somewhat more difficult to organize. Such input must come from individual service establishments in the community. Each job listing should include as much detail as possible about the work involved. A standard form for this purpose will facilitate matching an applicant to a job.

The placement official should attempt to expose a given student to as many suitable job openings as possible. Conversely, employers should be exposed to as many qualified candidates as possible. The placement official should take special pains to avoid matching up an applicant and a job that are obviously not suited to each other.

The final fit of placing technicians in an appropriate job is the joint responsibility of the student and the employer. The success of this final decision will be greatly enhanced when both student and employer have numerous interview opportunities and as wide an area of choice as possible.

The role of the Craft Advisory committee in placement is two-fold:

—To work closely with the school in establishing an adequate placement function and to evaluate its performance on a continuing basis;

—To work closely with all industry establishments in the community to encourage them to use the school's placement office; to provide adequate job information to the placement office; and to develop an effective procedure for interviewing and evaluating potential employees suggested by the school.

If the need for competent technicians is as great as claimed, and if the educational program performs in such a way as to produce qualified technicians, the failure of local service establishments to follow through with job listings and effective interviewing and hiring practices can seriously impair the ultimate success of the program. It is up to the Advisory Committee to make certain that student placement proceeds in a smooth and effective manner.

TEACHER CERTIFICATION AND QUALIFICATIONS

QUALIFICATIONS

The Teacher is qualified to teach by one of the following methods:

1. Regular or temporary Florida teacher's certificate with appropriate coverage;
2. Approval of local school board consistent with adopted school policy; or
3. Regular or temporary Florida teacher's certificate with other than appropriate coverage; has met all occupational experience requirements prescribed as a prerequisite to appropriate certification, and has been approved by the school board to teach out-of-field.

Refer to the Curriculum Framework for this program to determine the certification coverage for this program.

INSTRUCTIONAL STAFF

It is recommended that the instructional staff have technical competency and meet all state and local requirements for certification.

1. Technical Competency

   Instructor(s) sould have demonstrated technical competency and should hold current, nationally recognized certification in the laboratory areas taught. Instructors should hold current, nationally recognized certification, if awarded.

2. Instructional Certification

   Instructors should meet all state certifying requirements.

3. Technical Updating

   Faculty members should be provided technical materials required to maintain their competency. An opportunity should be provided for instructor(s) to return to industry on a regular basis for in-service and skill upgrading.

4. One or more instructor(s) in each department should hold a current American National Red Cross Standard First Aid Certificate.

5. Substitutes

   A systematic method of obtaining "substitute" or "supply" instructors should be used to assure instructional continuity. An orientation session for substitutes should be held on a regular basis. The substitute should be a competent instuctor in the occupational area and specific competencies taught.

FACILITY DESIGN CRITERIA

INTRODUCTION

Even the best instructor should not be expected to turn out competent and immediately productive graduates if they are forced to learn with out-of-date, improper, or inadequate facilities, tools, and equipment. Planning for and providing the proper facilities, tools, and equipment are difficult parts of establishing a training program, especially when space and budgetary constraints are considered. Facilities, tools, and equipment should be adequate to meet teaching objectives.

This section of the Program Guide contains guidance for setting up classroom activities as well as lab or shop facilities. Diagrams of typical classroom and shop layouts are contained in Appendix A.

REAL-LIFE FACILITIES

The training facility cannot duplicate the real-life facility in which the student will work after graduation. However, the more the school resembles the industrial environment, the easier it will be for the student to make the transition from school to work. Tools, supplies, and test equipment should conform to local industry usage. Although different facilities may utilize different makes of tools and equipment, the actual differences in operation of most equipment are usually not so great. The on-the-job training each graduate will inevitably receive will usually reconcile differences between equipment used in the school and that in the commercial shop.

TEACHING FACILITIES

Additional facilities and equipment will be required that are peculiar to the teaching job itself. Among the more important are:

> Classroom space;
>
> Audio-Visual Equipment—motion picture, slide, filmstrip, and overhead projectors; videotape units; microfiche readers;
>
> Special devices to demonstrate basic principles and theory;
>
> Duplication of tools and appropriate equipment to enable several students to work individually on the same service operation;
>
> "Live Work" area(s) or laboratory facilities.

A superior instructor could no doubt make do without much of this equipment. But the availability of state-of-the-art training devices enhances the effectiveness and efficiency of any classroom.

Efficiency means achieving instructional objectives in the shortest time possible. By reducing training time and lost motion, the "return on investment" of the facility increases, competent maintenance persons enter the industry more quickly, and the individual student initiates a career and begins producing personal income sooner.

UPDATING FACILITIES

Facilities and equipment need updating just as curriculum, course content, and instructor capability do—and for the same reasons: technological change and improvements from year to year. Updating facilities and equipment may be more costly than updating course content—but failure to do so, at least minimally, will almost certainly impair the effectiveness of the program in a relatively short time.

DETAILED FACILITIES ANALYSIS

The advisory committee can assist the school in establishing priorities for installing facilities, tools, and equipment. Some are necessary; others are advantageous; and some can be considered nice to have, but essentially unnecessary. Careful planning and analysis of needs over several years can, however, lead to the establishment of a first-rate facility in almost any community.

FACILITIES ORGANIZATION

In planning adequate facilities, one of the more critical considerations—and one that is far too often underestimated—is providing adequate space to meet the changing needs of the instructional program. Buildings should be designed and constructed for future expansion.

WORK STATION ARRANGEMENT

The arrangement of work stations and specialized equipment depends upon the general shape of the facilities, the number of specialized areas depends, to some extent upon the preferences of staff. However, a few fundamentals should be kept in mind:

Convenient location of entrances and exits;

Easy access to and among service benches;

TRAFFIC FLOW

The overall layout of the service facility should be planned so that the location of entrances and exists permits a logical flow of work in progress. The arrangement of benches to obtain an efficient traffic pattern is one of the most critical factors in planning a facility.

PERSONAL TOOL/EQUIPMENT STORAGE AREA

A student tool storage room or area should be provided, with adequate shelf space for tool boxes and floor space for equipment. This area should afford maximum security for student tools.

ADDITIONAL FACILITY CONSIDERATIONS

1. **Training Stations**

   Training stations and live work areas must be available in the type and number required for the performance of the tasks outlined in the program goals and performance objectives.

2. **Safety**

   The facilities must meet all applicable safety standards.

3. **Maintenance**

   A regular facilities maintenance program should be used to assure facilities are suitable when required for instruction.

4. **Housekeeping**

   The classroom, laboratory, and support area(s) should be kept clean and orderly.

5. **Office Space**

An area separate from the classroom and laboratory should be available and convenient for use by the instructor(s) as an office.

6. Instructional Area

A classroom convenient to, but separate from, the laboratory area should be available for instruction and other non-shop activities.

7. Storage

Storage areas for tools, parts, supplies, and machines must be sufficient to support the activities outlined in the program goals and performance objectives. Security should be provided to prevent pilferage and vandalism.

8. Support Facilities

Restrooms, clean up areas, and lockers should be provided convenient to the instructional area.

9. Ventilation

If required, an adequate fume removal system should be in place and operable. When appropriate, heating and cooling systems should be used to provide sufficient comfort for learning.

10. First Aid

A first aid station must be in place, well marked, and complete with appropriate supplies.

11. Facility Evaluation

The advisory committee should be asked to conduct an annual evaluation of the facilities to assure adequacy to meet program needs.

SUGGESTED EQUIPMENT LIST

PLUMBING

QUANTITY	ITEM DESCRIPTION
	Hard Hats
	Pipe Wrenches, 14", 10"
	Crescent Wrenches, 12", 10"
	Basin Wrench
	Socket Key Set
	Dittos, 9/16", 3/8", 7/16"
	Channel Locks
	6" Rule w/extension
	Irons, Packing, Driving, Outside
	No. 2 Joint Runner
	4" Ladle
	Striker
	Safety Glasses
	Hack Saw
	No. 15 Cutter
	No. 20 Cutter
	Pack (1) Hack Saw Blades
	Plumb Bob
	Chalk box (with line)
	16 oz. Ball Peen Hammer
	1/2" Center Punch
	1/2" Round File 8"
	Screwdrivers; 9", 6", 4"

Rat-tail File, 8"

Ball String Line

Putty Knife

Pair Imp Cutters

Slip Joint Pliers

6" Phillips Screwdriver

Snips

Air Compressor & Attachments

Auger, Closet

Awls, Marking or Scratch

Brace & Bit

Bending Block & Pins

Builders's Level (or Transit & Tripod)

Calipers

Chain Tongs

Chisels; Brick, Cold, Floor, Wood

Code Books

Cut-off Machine (abrasive)

Dividers or Trammels

Drain Cleaners; Hand Spinner, Power

Drills; Hand, Portables (air, electric & power angle head)

Easy Outs, Assorted

Flaring Tool & Block

Flaring Tool, Hammer Type

Flaring Tool, Plastic Pipe

Gauge Glass Tube cutter

Grappler Hook

Grinders, Bench or Pedestal, Portable

Hammers; Ball Peen, Claw, Mason's, Sledge, Tinners

Hoist, Cable (come along)

Hoist, Personnel (or lift)

Irons; Driving, Inside, Outside, Packing (yarning)

Joint runners

Knockout, Hydraulic ("Greenly Knockouts")

Ladders

Ladles, Plumber's

Mattock Pick

Melting Furnace

Mercury Column

Metal Scrapers

Meter, Milivolt

Meter, Volt-Amp ("Amp probe")

Orifice Meter

Pipe (tubing) Cutters; Brass-copper, Internal (inside cutter-copper), Internal (inside cast-iron), Midget, Plastic, Steel

Pipe Cutter, Power

Pipe Reamers; Hand, Power

Pipe Vise, Chain

Pipe Vise, Yoke

Pliers, Assorted

Plumb Bob

Plunger Vacuum ("Plumber's Helper")

Plunger, Hard Back

Power Drive

Pressure Tester (Kuhlman Type)

Pry Bar

Puller, Faucet Handle

Pulling Tool (Soil Pipe)

Punches, Assorted

Putty Knife

Rule, Circumference

Rule, Folding

Rule, Retractable Steel Measuring Tape

Saws; All-purpose Gasoline Powered, Hand Compass, Hand Hack Saw, Hand Jab, Hand Universal, Hole, Portable (Band, Circular,Sabre), Reciprocating (sawsall)

Scaffolds

Seat Burnisher (re-seating tool)

Shears, Hand

Shovels, Assorted

Sink Clamp Tool

Slings

Snips

Soldering Irons

Spirit Level, Line

Spirit Level (torpedo)

Square, Carpenter's (tri-square)

Square, Framing

Star Bit

Striker

Swaging Tool (Swage Punch)

Tap & Die Set

Test Plugs

Test Pumps

Torch, Air-Acetylene

Torch, Hot air

Torch, Oxyacetylene

Torch, Propane

Tube Bender, Gear Ratchet

Tube Bender, Lever Type

Tubing Bender, Spring Type

Turnbuckles & Clamps

Vise, Combination (Plumber's, Machinist's)

Water Curb Box Key

Welder, Electric Arc

Welder, Inert-Gas Metal-Arc

Welding Helmet

Welding, Goggles

Wrenches, Assorted

SAFETY

The Florida State Board of Education establishes rules for the operation of public schools. Part III, Section B, Chapter 6A-2 of the State Board of Education Rules contains the standards for existing educational facilities. Subsections deal with the entire school facility in regard to such topics as electrical equipment, flammable materials, ventilation, fire safety, storage, and illumination.

Specifically, subsection 6A-2.97, which follows, contains regulations unique to Vocational classes.

S.B.E. Rule 6A-2.97: Safety devices in shops, laboratories, and other process areas

(1) Use of personal protection devices and other protective equipment is required when students and staff are exposed to the following:

(a) Arc welding, heavy gas cutting, scarfing
(b) Spot welding, brazing, or cutting
(c) Machining of any materials causing flying chips
(d) Injurious radiations, dusts, fumes, gases, vapor mists
(e) Sledging, hammering, chipping, scaling, drilling, grinding, chiseling, wire brushing, and caulking operations where flying objects or particles may strike the body
(f) Chemicals, acids, caustics, and molten metals

(2) Personal protection devices which come in contact with the skin shall be sanitized after each use.

(3) Clothing, jewelry, and personal grooming of personnel in shops and labs shall not constitute a hazard.

(4) Individual equipment power shut-off, within reach of the operator, shall be provided for all working machinery. Each individual machine shall be equipped with an approved electromagnetic starter switch.

(5) No safeguard, safety appliance, or safety device guarding a machine or machine part shall be removed or made ineffective except when the machine is stopped and for the purpose of immediate cleaning, repairing, or adjusting. Upon completion of repairing, cleaning, or adjusting, such guard, appliance, or device shall immediately be replaced. Any shop or laboratory tool or equipment found to be unsafe shall be red-tagged and removed from service until the condition is corrected.

(6) The floors in areas where machines are used shall be kept free from waste, grease, and obstructions.

(7) Welding operations shall be located in a shielded area, and

the area shall be free of combustible material and persons not wearing protective devices.

(8) Areas where toxic fumes are produced shall be properly vented to the outside.

(9) Flammable fumes or dust produced in a student-occupied facility shall be mechanically exhausted to the outside with approved explosion-proof motor-driven equipment with filters in place.

(10) Each space equipped with unprotected gas valves accessible to students shall have an approved master cut-off readily accessible to the instructor.

(11) Each shop or lab equipped with electrically powered machinery accessible to students shall have one or more conspicuously color-coded disconnect switches at convenient locations throughout the space.

(12) Kilns shall be properly shielded from combustibles, combustible surfaces, and personnel, and shall not be located in the path of or adjacent to any means of egress, or exposed to unauthorized persons.

(13) Automotive, body, and frame repair areas requiring welding and cutting shall be separated from engine overhaul and

related fuel handling activities.

(14) A tire cage shall be provided when pressurizing tires on split rims.

(15) Vehicle lifts shall be provided with a mechanical safety lock.

(16) Piping and working machinery with component parts shall be safety color-coded in accordance with ANSI Z53.1-1971.

(17) The safety color-coded chart shall be posted in a conspicuous place available to employees and students.

(18) Hazardous work and storage areas shall be identified by appropriate caution signs.

(19) All equipment designed to be permanently mounted shall be securely fastened to its supporting surface.

(20) Safety zone lines shall be used on the floor area surrounding working machinery.

(21) Fume hoods shall be provided and kept in proper operating condition. Operations where flammable gas, toxic vapors, or noxious odors are given off shall be performed in the

fume hoods.

(22) Safety equipment such as showers and floor drains, eye wash, fire blankets, and proper extinguishing equipment shall be provided, properly installed, and maintained correctly.

INSTRUCTOR RESOURCES

LEARNING RESOURCES

Support material consistent with both program goals and performance objectives should be available to staff and students.

1. Service Manuals

   Manuals with current manufacturer's service procedures and specifications. These manuals must be located where students can use them while working in the shop area.

2. Multi-Media

   Appropriate up-to-date multi-media materials such as flip charts, tape slides, motion pictures, overhead transparencies and video projection media should be decentralized, readily available wherever possible, and utilized in the training process.

3. Instructional Development Services

   The services of professional instructional development personnel should be used when available. At a minimum, equipment and supplies should be available for duplication of printed material and overhead projector transparency development. Instructional development personnel should conduct in-service workshops and/or other training in curriculum and media development on a structured basis.

4. Periodicals

Current general and technical magazines and newspapers should be available for student and instructor use.

5. Student Materials

Necessary instructional texts or pertinent material should be available for each student to satisfy the objectives of the mode of instruction used. Where textbooks are used, specialized texts should carry a copyright date no older than 3 years, basic texts no older than 6 years.

PRINTED AND AUDIOVISUAL MATERIALS

This list contains an extensive number of organizations providing training materials. Some materials are free; for others, there is a charge. Details should be requested in writing prior to ordering.

PUBLICATIONS

1. Plumbing, Keith Blankenbaker.
2. Standard Plumbing Code.
3. National Plumbing Code.
4. Plumbing, Ripka.
5. Plumbing Illustrated Basic, Massey.
6. Starbuck Series.
7. Babbitts Book of Plumbing, Babbit.
8. Pipefitter/Welders Handbook, Frankland.
9. Teaching Academically Disadvantaged Students in Vocational Education Courses, DD012 BK-82, Florida State Department of Education, Vocational Division.
10. Keys to Managing Competency-Based Instruction, TE036 BK-77, Florida State Department of Education, Vocational Division.

11. Guidelines for the Review and Selection of Instructional Materials for Competency-Based Education, TE034 BK-80, Florida State Department of Education, Vocational Division.

12. Employability Skills Series, CE001 SS-81, Florida State Department of Education, Vocational Division.
(CE003, CE004, CE009, CE010, CE017, CE018, CE024, CE025, CE029, CE030, CE037, CE038)

AUDIO VISUALS

1. Rough Plumbing and Heating, AV 696.1 BAS C.1, Prentice-Hall Media.

2. Introduction to Installing Utilities #2788, McKnight Career Education.

3. Mechanical and Electrical Systems, Prentice-Hall Media.

4. Repairing a Sink Faucet, AV 696.182 REP C.1, Prentice-Hall Media.

5. Toilets, AV 696.182 TOI C.1, Prentice-Hall Media.

6. Basic Concepts in Residential Architecture, 944, Prentice-Hall Media.

7. Oxyacetylene Safety and Setup, Library Filmstrip Center.

8. Residential Plumbing, PLR 12 ea. DCA.

9. Basic Plumbing Skills, PLR 9 ea. DCA.

PROFESSIONAL ORGANIZATIONS AND SUPPORT SERVICES

PROFESSIONAL ORGANIZATIONS

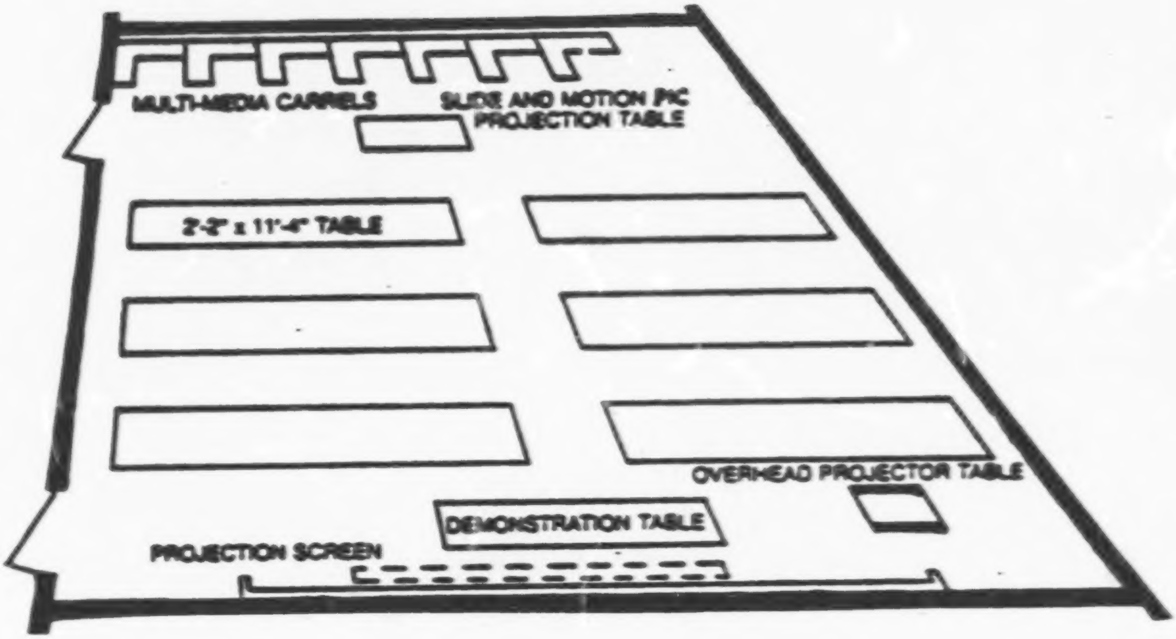
Membership in professional associations offers vocational educators an enormous range of opportunities for working together to strengthen the field and to develop personal competence and satisfaction in work. The associations have similar goals and activities. They seek excellence in program content by means of joint efforts among members, communications that keep members current, forums for the discussion of issues in the field, useful and stimulating publications and sound professional growth experiences at local, state, regional, and national meetings and annual conventions. They are concerned with increasing public understanding and support of the field.

VOCATIONAL INDUSTRIAL CLUBS OF AMERICA (VICA)
FLORIDA ASSOCIATION OF PLUMBING/HEATING/COOLING CONTRACTORS (FPHCC)
Tallahassee, Florida.

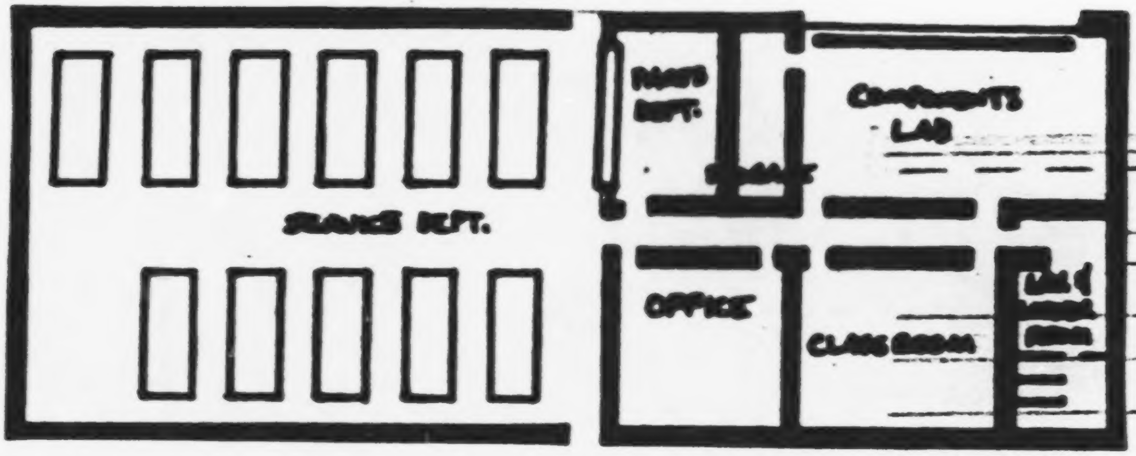
APPENDIX A

FACILITIES DIAGRAMS

SUGGESTED LAYOUT FOR A CLASSROOM

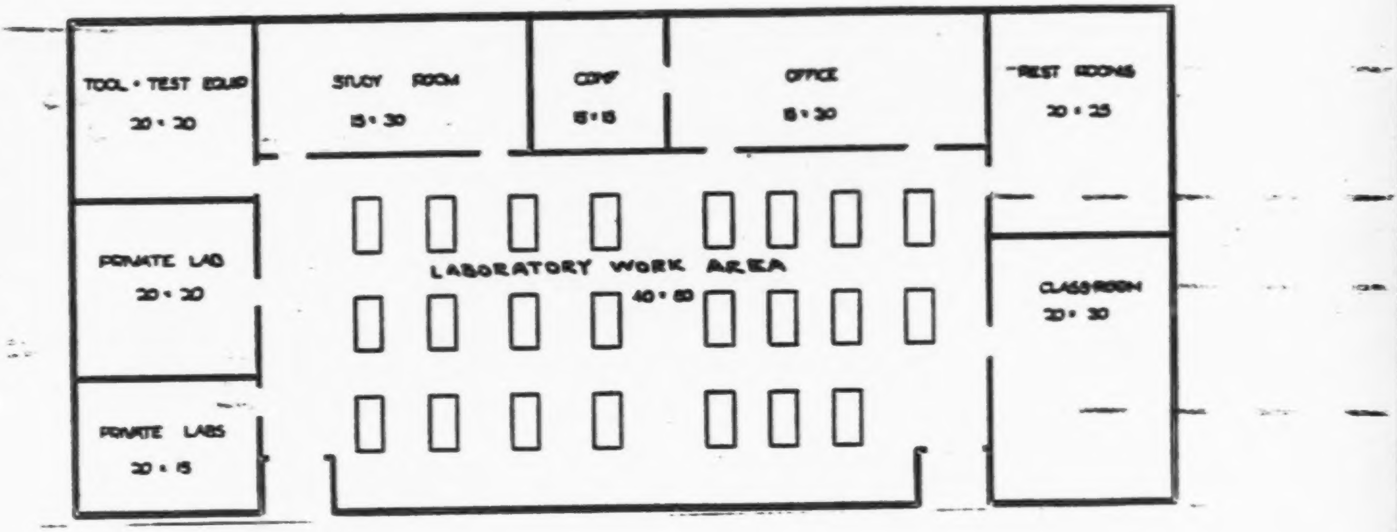

MULTI-MEDIA CARRELS
SLIDE AND MOTION PIC PROJECTION TABLE
2'-2" x 11'-4" TABLE
OVERHEAD PROJECTOR TABLE
DEMONSTRATION TABLE
PROJECTION SCREEN

TYPICAL LABORATORY OR CLINICAL SETTING


PARTS DEPT.
COMPONENTS LAB
SERVICE DEPT.
OFFICE
CLASSROOM

BEST COPY AVAILABLE

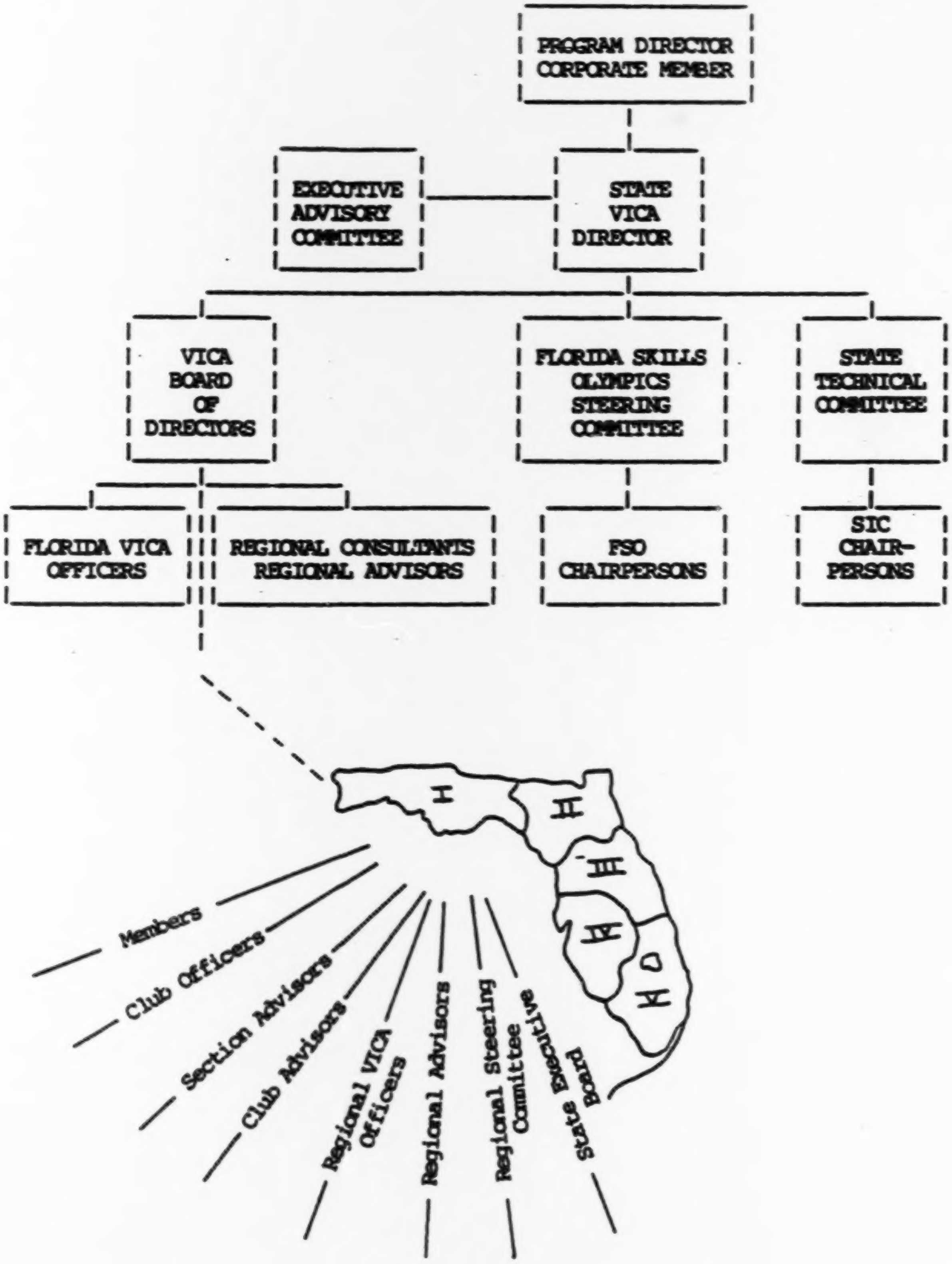
TYPICAL COMBINATION OF CLASS/LAB AREAS


TOOL • TEST EQUIP
20 • 20
STUDY ROOM
15 • 30
COMP
15 • 15
OFFICE
15 • 30
REST ROOMS
20 • 25
PRIVATE LAB
20 • 20
LABORATORY WORK AREA
40 • 80
CLASSROOM
20 • 30
PRIVATE LABS
20 • 15

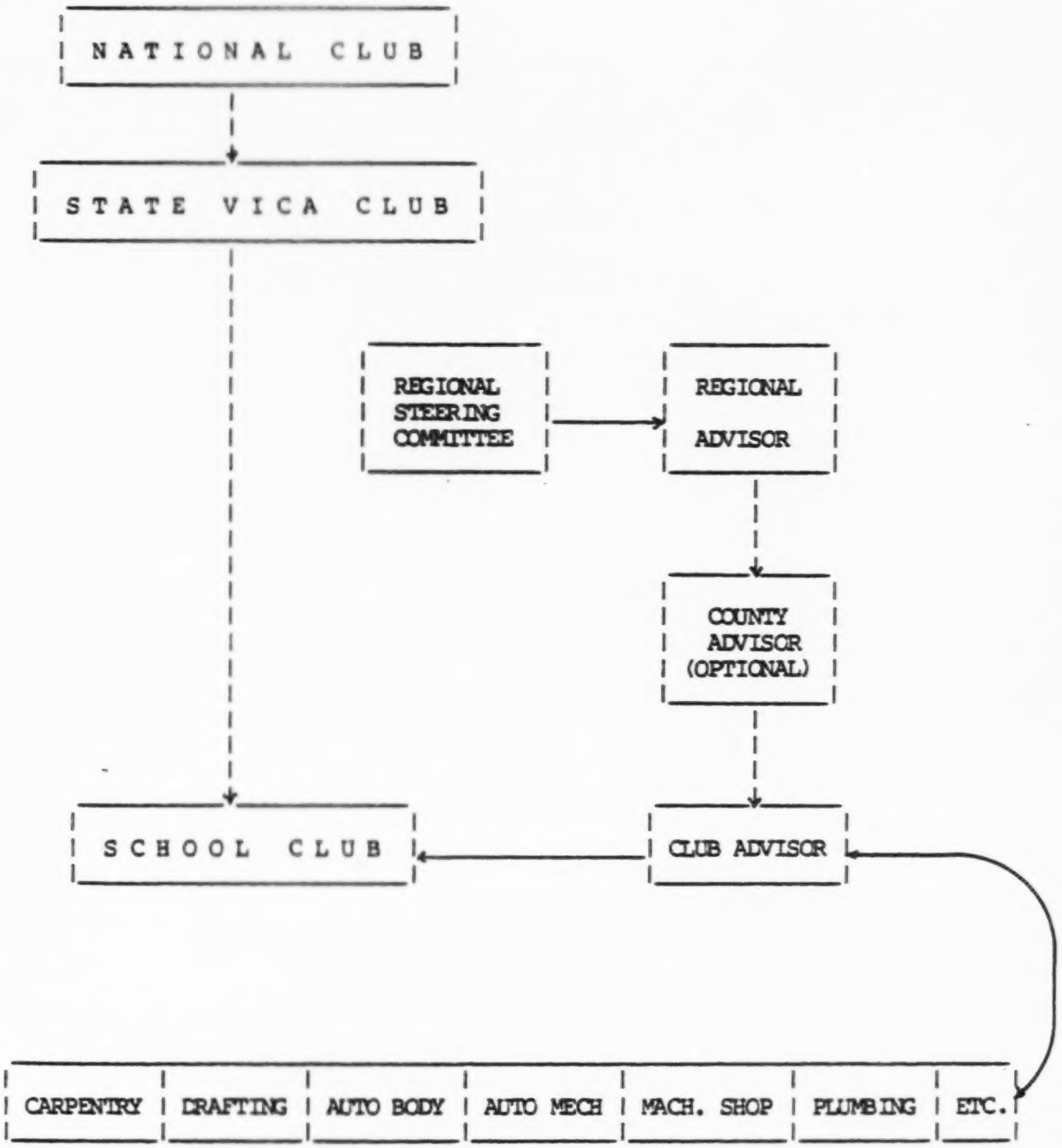
APPENDIX B

VICA ORGANIZATION CHART

B-1


PROGRAM DIRECTOR
CORPORATE MEMBER
EXECUTIVE ADVISORY COMMITTEE
STATE VICA DIRECTOR
VICA BOARD OF DIRECTORS
FLORIDA SKILLS OLYMPICS STEERING COMMITTEE
STATE TECHNICAL COMMITTEE
FLORIDA VICA OFFICERS
REGIONAL CONSULTANTS
REGIONAL ADVISORS
FSO CHAIRPERSONS
STC CHAIR-PERSONS
I
II
III
IV
V
VI
Members
Club Officers
Section Advisors
Club Advisors
Regional VICA Officers
Regional Advisors
Regional Steering Committee
State Executive Board

B-2


NATIONAL CLUB
STATE VICA CLUB
REGIONAL STEERING COMMITTEE
REGIONAL ADVISOR
COUNTY ADVISOR (OPTIONAL)
SCHOOL CLUB
CLUB ADVISOR
CARPENTRY
DRAFTING
AUTO BODY
AUTO MECH
MACH. SHOP
PLUMBING
ETC.